From:	Joel Geier
To:	Benton Public Comment
Subject:	LU-24-027 Coffin Butte Landfill expansion: Response to new evidence (construction impacts)
Date:	Wednesday, July 16, 2025 12:37:24 PM
Attachments:	Geier_01_ConstructionImpacts.pdf Geier_02_MapOfCommenters.pdf Geier_03_AirborneTrash.pdf Geier_03_AirborneTrash Annex1.pdf Geier_03_AirborneTrash Annex2.pdf

Dear Chair Fowler, Vice Chair Hamann, and Planning Commissioners Biscoe, Cash, Fulford, Lee, Struthers, and Wilson:

Thank you for your continuing attention to the complex issues surrounding this application.

The attached documents will be the first 3 of 8 submissions which I'm sending in response to new evidence presented at the July 8-9th hearing.

These cover the following topics:

1) impacts of landfill construction as inseparable from landfill operations
2) map of land uses pertaining to comments in opposition
3) airborne trash and ineffectiveness of applicant's proposed measures for control.

For the third of these topics, I also include two numbered annexes. Annex 1 is the contract between the applicant and the Benton County sheriff's department for roadside cleanup services, 2023-2025. Annex 2 is an addendum to that contract, executed in January/February of 2025, by which the applicant agreed to pay for an increased frequency of clean-up during the CUP application period, through June 30th of this year.

Yours sincerely,
Joel Geier
38566 Hwy 99W
Corvallis OR 97330-9320

Issue:

Impacts of landfill development, including site preparation (excavation and construction or relocation of infrastructure) must be considered as part of the impact of the overall development. Due to the ongoing and intermittent nature of landfill development, the ongoing impacts of landfill development must be considered in relation to the conditional use criteria.

This is relevant in particular for your consideration of noise and seismic disturbance from blasting, and risk of reduced groundwater availability (wells and springs), but may also apply to other impacts arising from site development such as traffic. These issues have been identified in prior testimony by opponents (both written and verbal). That prior testimony must be considered in light of the unique nature of the proposed development, as recognized by Oregon statute.

New evidence:

Republic's slide deck for July 8th, slide 20 proposes a revision to county staff's proposed Condition of Approval OP-14: the following**:**

> Revised: Applicant shall not dispose of waste north of Coffin Butte Road during the Development Area's operation. Only one working face shall operate at a time. However, Applicant will be allowed to utilize two working faces during a short-term, three-month-or-less "transition period" ... Applicant shall proactively notify the county of the date the transition period is scheduled to begin, and again when it ends.

This is new information, introduced in the July 8th portion of the hearing. It suggests a staged process for operation of the proposed new landfill, concurrent with operation of the existing landfill. Applicant's presentation on July 8th further clarified that the initial disposal area referenced above will only be a portion of the proposed new landfill area, and that construction (including blasting and excavation) on other portions of the area will take place intermittently over a 3 to 4 year period. The intermittent, staged nature of development is relevant for assessing impacts, as we will discuss below.

Republic's slide deck for July 8th, slide 27 states the following**:**

> ***CONSTRUCTION SEQUENCING***
> *Coffin Butte Landfill estimates that work will proceed in this general order:*
>
> - ....
> - Leachate storage pond construction will follow with intermittent blasting between the hours of 12 p.m. and 5 p.m.
> - ...
> - Relocation of building in the expansion area footprint.
> - Removal of soil from expansion area to use as daily cover.

This differs in at least two significant respects from how the construction sequence was outlined in applicant's Exhibit 47, and thus constitutes new information.

First, the blasting for leachate pond construction is stated to be **intermittent**, which means "stopping and starting at intervals"[1] This was not mentioned in Exhibit 47, which implied a single phase of excavation and blasting. The difference is significant as intermittent disturbance at irregular intervals may affect use of neighboring properties and public roads differently from if activities causing disturbance are carried out within a well-defined period, with definite start and stop dates.

Second, the building in the expansion area footprint will be **relocated** rather than simple removed (as stated in Exhibit 47). Removal (whether by demolition or deconstruction) is a relatively simple process, whereas relocation means that the building will be shifted to or re-erected on another part of the site.

As an aside, applicant's site drawings (for example Exhibit 50) do not show where this building is to be relocated. The building is currently located near the leachate ponds and is used to support leachate handling operations, so we might speculate that it will be moved to an equivalent location with the new site configuration. That would mean locating it on Forest Conservation land, which would presumably require a separate permit if it is not covered by the permit sought in LU-24-027.

We also note that blasting and other excavation as part of landfill cell preparation are not mentioned in this sequence as presented on this slide, although this was given attention in Exhibit 47. Potential for blasting impacts during landfill construction to affect groundwater is discussed on two other slides presented by the applicant on July 8th.

In oral statements responding to questions by the Planning Commission on July 8th, the applicant clarified that excavation to prepare the base of the new landfill cells would not be distinct from the operating period. Instead blasting and excavation would occur during 6- to 8-month portions of the year, over a period of up to four years, first for the leachate ponds and then the new disposal areas as these are developed in stages.

Staff Slides to Planning Commission LU24027 July 8, slide 41 states**:**

> ***P2-2 Construction Phase.***
>
> *During construction of the expansion area for commercial use (construction of the leachate ponds, haul road, new landfill cell, and employee building), Applicant shall:*
>
> *(A) Limit construction to the hours of 6 a.m. to 6 p.m.*
>
> *(B) Limit any required blasting to the hours of 12 p.m. to 5 p.m.*
>
> *(C) Conduct all blasting pursuant to its approved permit issue by the Oregon Department of Geology and Mineral Industries (DOGAMI).*

In the same slide, staff assert that this pertains to *"construction conditions – not responding to CU criteria"* and BCC *"99.110 Sensitive Land consideration."*

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1 American Heritage Dictionary of the English Language, 5th Edition.

Response:

Impacts of landfill development, including site preparation (excavation and construction of infrastructure) must be considered as part of the impact of the overall development.

In new evidence presented during the July 8-9 hearing, the applicant was unable to delineate between the construction sequence and operation of the proposed new landfill. Applicant stated that construction activities could be spread over as many as four (4) years, for a facility that is expected to provide airspace for as few as six (6) years' worth of garbage.

Landfill operations are defined by statute. ORS 517.750(16)(b)(F) states:

> *(b) "Surface mining" does not include:*
> *(F) Excavation or movement of materials on site at a landfill, as defined in ORS 459.005, for the primary purpose of construction, reconstruction or maintenance of access roads or for landfill operations, including but not limited to landfill cell construction and daily, interim and final cover operations, if the excavation or movement of materials is covered by a permit issued by the Department of Environmental Quality under ORS 459.205 to 459.385;*

Parsing clause (16)(b)(F), we note that it mentions two separate things, separated by an "or":

- *for the primary purpose of construction, reconstruction or maintenance of access roads,* or
- ***for landfill operations, including but not limited to landfill cell construction** and daily, interim and final cover operations*

This recognizes the unique character of landfill operations, as an ongoing construction process in which the economic use is synonymous and concurrent with building a complex structure – the landfill – as layers of various types of waste, geological materials (rock or soil), and synthetic materials (liners, geotextiles etc.).

The landfill industry, including VLI's current operations at Coffin Butte Landfill, takes advantage of this unique status under Oregon statute. They freely and intermittently conduct blasting operations that, if not for the above clause, would be regulated by DOGAMI as "surface mining."

Blasting as part of the current operation of Cell 6, north of Coffin Butte Road, was mentioned by witness testimony during the July 9th portion of the hearing. This activity has also been acknowledged by the applicant in previous written testimony. The applicant has asserted a right to conduct blasting intermittently in the footprint of the proposed new landfill, as part of a phased development that will overlap in time with the proposed economic use of the new landfill.

Along with the specific treatment of landfill construction as part of landfill operations in ORS 517, as Planning Commissioners you can also apply **common sense**: When a proposed use is expected to last only 50% longer than the duration of construction, and these two overlap, it is only reasonable to consider the various construction stages in assessing impacts on adjacent properties and public facilities.

Issue:

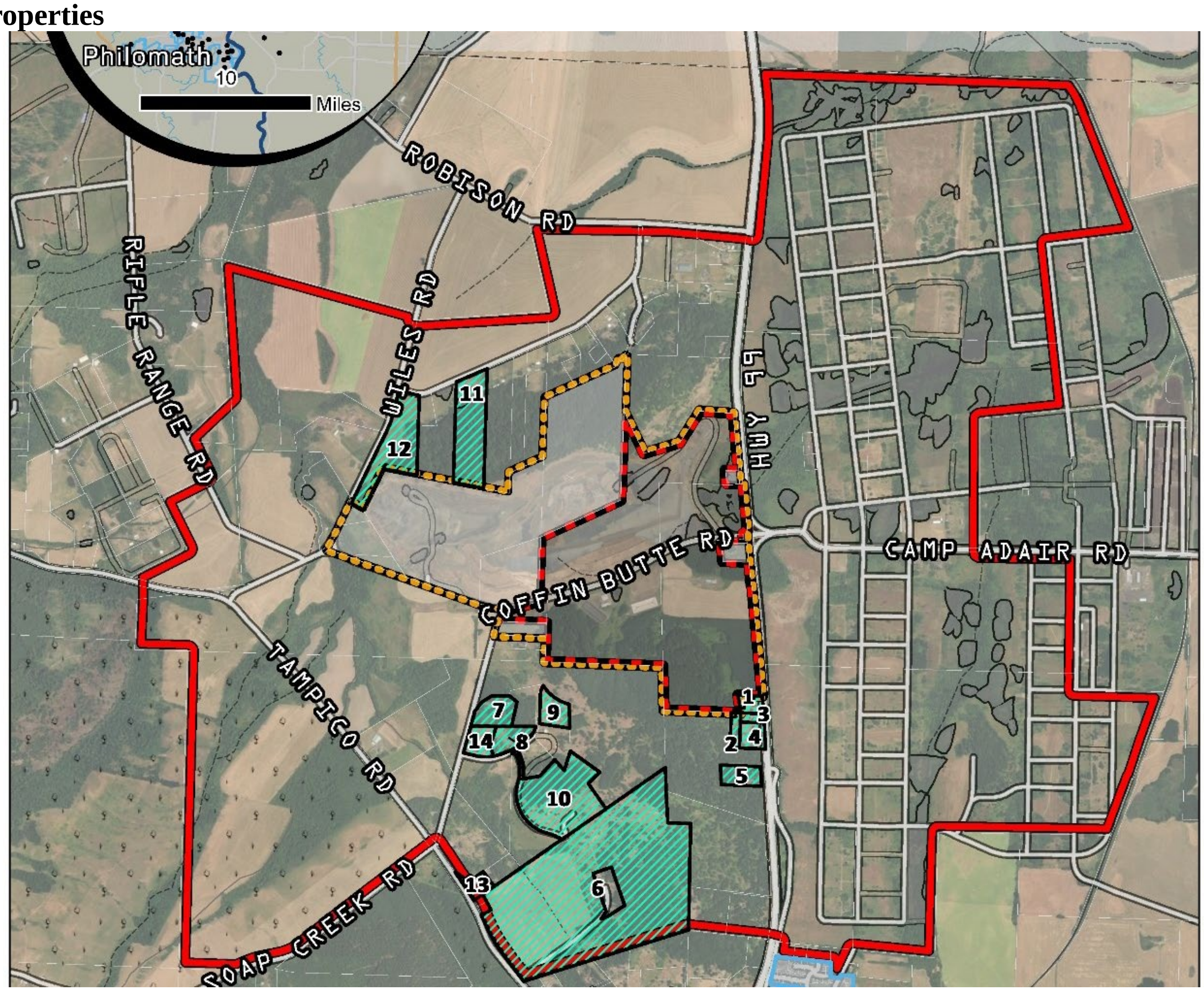
The map of responses relating to uses on adjacent property, as presented by Staff on July 8th, does not include all private property lots for which owners submitted comments in opposition to the proposed CUP. The map also omits adjacent properties owned by public institutions of the State of Oregon, which were cited by many members of the public, in reference to both their direct use of those properties for recreation, and their indirect use as beneficiaries of cultural and conservation resources on those lands.

A significantly different picture of impacts on uses of adjacent properties emerges, when those private and public properties are properly accounted for. A revised map is provided here to aid in your assessment of this issue.

New evidence:

Benton County STAFF REPORT PRESENTATION titled “Staff Slides to Planning Comm LU24027 July 8” (Munidocs, 9. New Evidence from July 8-9 Hearings, Item #32, “Staff Slides to Planning Comm LU24027 July 8”);

Slide 14: KEY FINDINGS BCC 53.215 (1) – uses on adjacent property: Testimony from 14 properties



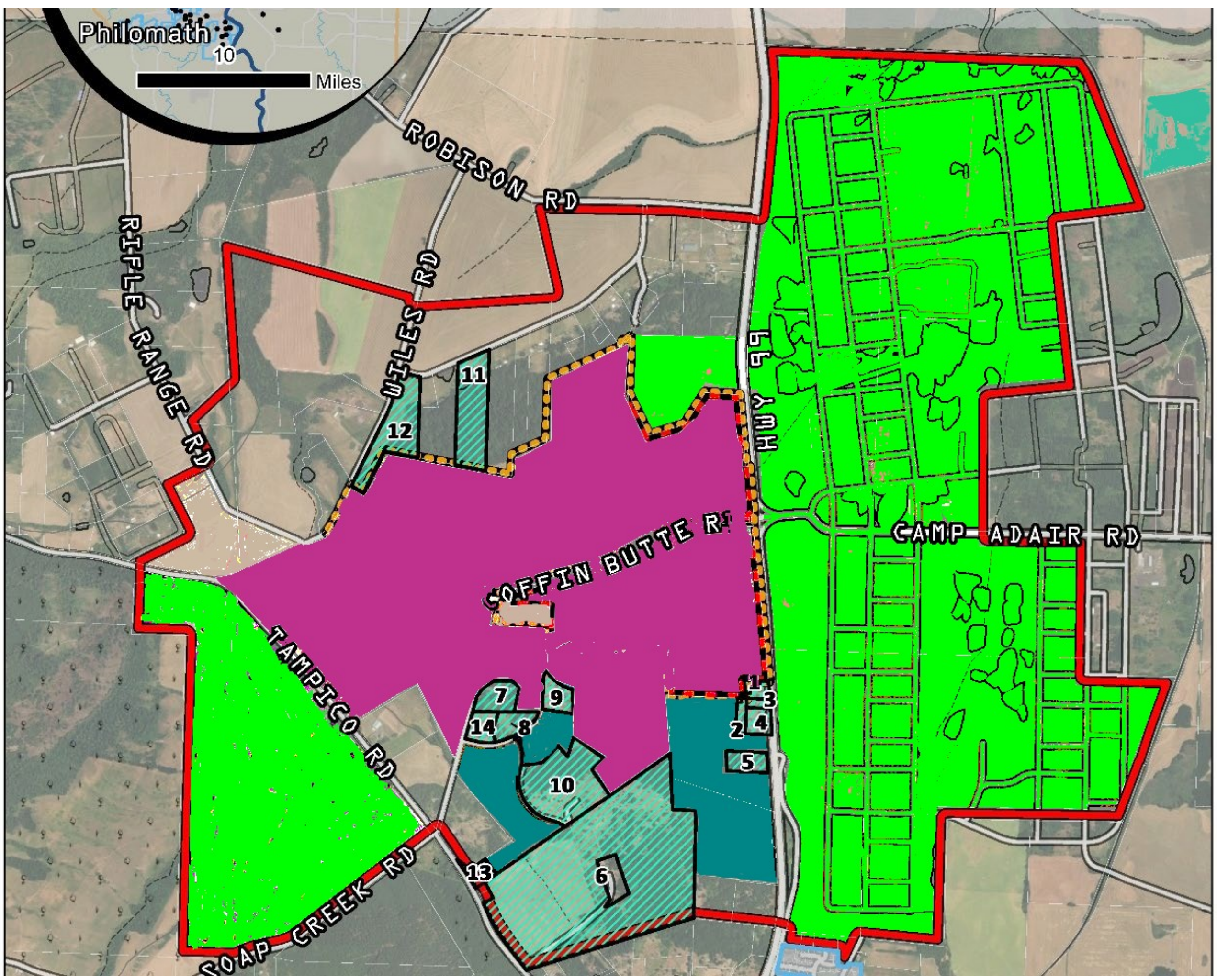
Response:

The map provided by Staff inaccurately omits testimony from the (Ted) Carlson, (Rick) Kipper, (Norm and Debra) Johnson and (Ken and Sarah) Edwardsson families which is on the record, and perhaps others.

This map also fails to represent the comments of many Benton County residents as well as non-profit organizations (including Mid-Willamette Bird Alliance and Sierra Club) who cited recreational use of E.E. Wilson Wildlife Area and Dunn Forest. The latter includes the OSU Soap Creek Beef Ranch, which in turn is home to the Letitia Carson Legacy Project on the historical Carson homestead.

These state-owned or state university-owned lands belong in common to the people of Oregon. Comments by Oregon residents who value these lands for recreational, cultural, and conservation purposes should be respected and represented.

Below is a map that more accurately represents ownership of properties for which comments have been submitted to the record in opposition to the proposed new landfill. Dark bluish green areas are private lands belonging to the Kipper, Carlson, Edwardsson and Johnson families as mentioned above. Bright green areas represent E.E. Wilson Wildlife Area (to the east and north) and OSU's Dunn Forest/Soap Creek Ranch (to the west). Magenta areas show land owned by the applicant.



This map, though more accurate than the one supplied by Benton County staff, might still be missing some properties whose owners oppose this CUP. We are aware of at least three more property owners within the red-bounded area who have been supportive of VNEQS efforts and/or submitted comments in opposition to the 2021 CUP, and many more who reside or own property just outside.

We also note that the area enclosed by red does not include many residential properties that abut the applicant's "buffer lands," particularly to the west. If the arbitrary boundary represented by the red area were extended just slightly west to include residential properties impacted by the landfill along Rifle Range Rd. and Trillium Lane, you would see even more areas colored in.

It has been noted in oral testimony that Polk County residents (just north of the dotted line in this map) did not receive timely notification from Benton County of this proposed land-use action.

We understand that Planning Staff were overwhelmed by the huge amount of testimony by the multitude of Benton County residents who oppose this landfill. Perhaps they didn't have time to correlate all of the addresses on testimony to property ownership, so that they could provide you with a more accurate map.

This provides another illustration of how the scope of the landfill operation's impacts far outstrips the capacity of the County to assess and regulate. If they can't even provide you with a proper map of properties corresponding to testimony received, we cannot expect that they will be able to enforce their proposed 84+ Conditions of Approval with respect to impacts on those properties.

Issue:

VLI has not been able to prevent plastic trash from becoming airborne and traveling off the site, to land landing in farm fields and pastures up to a mile south of the landfill, posing an ingestion threat to livestock as well as a fouling hazard for agricultural equipment. VLI's proposal is to just deploy more of the same ineffective fencing measures and occasional cleanups which have failed to eliminate the problem of airborne trash.

These methods have been ineffective for reasons which should be obvious. 4-ft high snow fencing along haul roads will not catch trash from trucks that are higher than the fence. Taller "bull fences" around the tipping area do not catch trash that is lifted above them by thermally generated dust devils or wind turbulence. Paying temporary employees or contracting for inmate crews to pick up roadside trash does not address trash that has already been carried out into fields and pastures on private land.

New evidence:

Written testimony submitted by McKenna Bradley on July 9th includes the following statement:

> I want to share with you my lived experience of living by the land fill for 17 years of my life. and present you with bags of trash collected from our property. This trash doesn't belong to us but it still ends up scattered along my fields! This trash belongs to Republic landfill. This trash has been gathered after falling down from the sky, onto my property or flying into my pastures from republic trucks.

Republic's slide deck for July 8th, slide 11 states the following**:**

> **LITTER**
> This topic was added to the supplemental staff report and was addressed by Coffin Butte Landfill after concerns were raised during public testimony.
> WHAT'S NEW
> • Clarified that portable "bull fencing" is used to catch litter before it becomes airborne. In addition, wire fencing is utilized along the main haul road.
> • Provided additional information about temporary labor force used to collect and dispose of litter.
> • Added details regarding landfill contract with the Benton County Sheriff's Department to pick up litter along Highway 99 and Camp Adair Road, from the landfill to Independence Hwy, 4x per month.
> MITIGATION EFFORTS
> • Maintain at least the same level of litter control measures as part of the expansion process.
> • Add a secondary line of bull fencing behind the existing line.
> • Install a third layer of fencing ('defender fencing'), 12 feet in height, around active and high-impact areas of the landfill.
> • Expand litter collection activities to include Tampico and Soap Creek Roads.

Republic's slide deck for July 8th, slide 12 shows figures of a new proposal by the applicant to install 8-ft high chain-link fencing around the perimeter of the proposed new landfill, where it borders lots zoned as Forest Conservation or Rural Residential.

Response:

Ms. Bradley's testimony regarding wind-blown trash originating from the landfill is affirmed by farmers and ranchers as far south as Brenneman x Tampico Road. Erin Bradley has also photographed plastic bags floating high overhead, heading southward from the landfill (Figure 1). In response to a complaint filed with DEQ, the landfill environmental manager at the time attributed this event to "dust devils" lifting plastic aloft from the working face.

Notably none of the photos supplied by VLI, showing measures that they promise to use, come from their existing operation at Coffin Butte. They claim that they will "add a secondary line of bull fencing behind the existing line." However recent photos of fencing near the current working face (Figures 2 and 3) shows that VLI hasn't even deployed a full line of "bull fencing." They have only deployed a few sections of this type of fencing, supplemented by a mish-mash of other types of fencing, some of which appears to be in poor condition, with wire mesh separating from the metal frames.

Applicant states that they utilize "wire fencing" along the haul road, but this is mainly orange plastic "snow fence" which appears to be the standard 4-ft high type used around construction sites. This fencing is ineffective due to its low height relative to trucks using the haul road. It also adds to the eyesore (visual impact).

Republic/VLI's contract with the Benton County Sheriff's Department was obtained through a public records request on May 14, 2025, and is included as Annex 1. This contract originally only called for the sheriff's department to provide inmate crews of at least 4 individuals for <u>two</u> days per month, not "4x per month":

2. COUNTY agrees to provide:
    a. COUNTY agrees to provide a number not less than 4 individuals from the Benton County Sheriff's Work Crew for a period of two days a month at a minimum of 8 hour work days, that is mutually agreed upon to perform litter pick-up among agreed upon locations within Benton County Limits.
    b. To submit invoice to REPUBLIC SERVICES by 15th of month following the quarter of services performed as outlined in this agreement.

This was amended on January 30, 2025, two weeks after VLI submitted their revised Burden of Proof for LU-24-027, to bump up the frequency to 4 times per month. Both that contract and the addendum expired on June 30, 2025. Contrary to Applicant's statements, the contract did not specifically call for crews to pick up trash both along Highway 99 and Camp Adair Road, but only "agreed upon locations within Benton County limits." In practice, the crews rarely pick up trash along Camp Adair Road as Hwy 99W requires almost continual cleanup.

The lack of cleanup along Camp Adair Rd. has been noted by Benton County residents and confirmed in conversation by sheriff's deputies. Figure 4 (from January 16, 2025, the day after VLI submitted their revised BOP) shows a typical situation where Camp Adair Road passes through E.E. Wilson Wildlife Area. VLI's proposal also does nothing to address trash blowing out into agricultural fields in Polk County and along Independence Hwy, which has been documented in prior written testimony.

In any case, the methods listed above have not succeeded in eliminating the problem of airborne trash landing in farm fields and pastures up to a mile south of the landfill. Simply deploying more of the same ineffective measures will not eliminate the problem.

Figure 1. Thin-film plastic bag floating in air high over adjacent property at N 44.691764, W123.221039 at 13:30 on July 24, 2024, photographed by Erin Bradley. A plastic bag is visible just as a white dot (circled for clarity) above the the rightward of two tall Douglas-fir trees known to be 80 to 100 ft high, on forest land belonging to Mr. Richard Kipper. This was one of numerous plastic bags seen floating southward on that date, high above trees on Tampico Ridge. This bag when photographed was already over 2/3 mile south of the existing landfill, and was observed with binoculars as it continued for at least another 1/4 mile to the south.

Figure 2. Photo of VLI's ineffective measures for limiting wind-blown trash around the current working face in Cell 6, taken from along Soap Creek Road about 1/4 mile south of the current working face at 07:15 on July 12, 2025 by Joel Geier. At this distance fugitive plastic debris is visible mainly as white dots (circled for clarity). At full resolution, white flecks of trash are visible all the way down the slope to the area just right of the haystack in the foreground. The top of a dilapidated 8-ft-high chain-link fence is barely visible, just to the right of the haystack, and overgrown by vegetation to the left.

Figure 3: Detail of the photo in Figure 2, showing a large strip of plastic sheeting about 10 to 15 ft long at the base of the dark slope below the "bull fence," as well as other fugitive plastic debris caught in the weeds and grass. Note that the "bull fence" is discontinuous with gaps filled by some other type of fencing.

Figure 4. Photo showing roadside plastic trash along Camp Adair Road, E.E. Wilson Wildlife Area on January 16, 2025, one or two days after VLI submitted their revised Burden of Proof.

AN AGREEMENT BETWEEN
BENTON COUNTY, OREGON
AND
VALLEY LANDFILLS, INC.

This is an agreement by and between BENTON COUNTY, OREGON, called COUNTY and VALLEY LANDFILLS, INC. ("Franchisee"), a wholly owned subsidiary of WASTE CONTROL SYSTEMS, INC., called REPUBLIC SERVICES, both corporations duly authorized to do business in the State of Oregon.

Whereas REPUBLIC SERVICES has the need for litter pickup within Benton County and the COUNTY is willing and able to perform such services by the Benton County Sheriff's Work Crew.

This agreement shall become effective July 1, 2023, and terminate on June 30, 2025. No work shall be performed under this contract until it has been signed by all parties

This agreement is effective for this period of time unless amended or canceled in writing and signed by both parties as described in the Termination Section of this agreement.

COUNTY, its employees, and agents are performing services under this Agreement as independent contractors and not as officers, employees, or agents of REPUBLIC SERVICES, supplying all equipment, tools, materials, and/or supplies to accomplish the work contemplated by this agreement at its own expense. COUNTY and REPUBLIC SERVICES shall perform the services described in this Agreement's Services Section.

LIABILITY

Each party, upon request, shall furnish the other with evidence of general liability insurance within the limits of tort liability required by the State of Oregon.

STATUTORY AND REGULATORY COMPLIANCE

Both parties agree to comply with all federal, state and local laws, ordinances and regulations applicable to the work under this contract, including, without limitation, the applicable provisions of ORS chapters 279A, B and C, particularly 279C.500, 279C.510, 279C.515, 279C.520 and 279C.530, as amended. In addition, both parties agrees to comply with Title VI of the CIVIL RIGHTS ACT of 1964 and comparable state and local laws. Both parties shall also comply with Section V of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 (Pub. Law No. 101-336), ORS 659A.142, ORS 659A.145, ORS 659A.400 to ORS 659A.406 and all regulations and administrative rules established pursuant to those laws.

WORKERS COMPENSATION

Both parties are employers under ORS Chapter 656, employing workers as defined in ORS 656.027. Both parties shall maintain currently valid worker's compensation insurance covering all workers, as required by ORS 656.017. Both parties shall maintain this insurance throughout the period of this agreement.

NONDISCRIMINATION

Both parties shall comply with all applicable federal, state, and local laws, rules, and regulations on nondiscrimination in employment because of race, color, ancestry, national origin, religion, sex, marital status, age, medical condition, disability, sexual orientation, gender identity or source of income.

PAYMENT OF SERVICES:

The total cost per day of services listed under this contract's services section will be one thousand one hundred and twenty dollars ($1,120.00). Contracted services will be for a minimum of two days per month, totaling six thousand dollars ($6,720.00) per quarter. COUNTY shall submit billing to REPUBLIC SERVICES quarterly by the 15th of the month following each quarter for services performed. The first quarter begins on July 1, 2023, when the contract is signed, and ends on September 31, 2023. Payment will be due thirty (30) days from receipt.

ASSIGNMENT/DELEGATION

Neither party shall assign, subcontract or transfer any interest in or duty under this agreement without the prior written consent of the other, and no assignment shall be of any force or effect whatsoever unless and until the other party has so consented.

TERMINATION

If either party fails to perform any of its obligations under this contract, within the time and in the manner provided, or otherwise violates any of the terms of this agreement, the other party may terminate the agreement by giving a ten day written notice to the violating party. Terminating party must state the reason for the termination. Either party may terminate the agreement due to a loss of funding to support the terms of the agreement. If REPUBLIC SERVICES terminates pursuant to this paragraph, COUNTY shall be entitled to receive full payment for all services satisfactorily rendered and expenses incurred; provided that there shall be deducted from such amount the amount of damage, if any, sustained by REPUBLIC SERVICES due to the breach of agreement by COUNTY. If COUNTY terminates this agreement pursuant to this paragraph; REPUBLIC SERVICES shall make full payment to COUNTY for all services satisfactorily rendered and expenses incurred.

IDEMNIFICATION

Both parties mutually agreed to indemnify, and shall hold harmless, indemnify, and defend its officers, agents, and employees from any and all liability, actions, claims, losses, damages or other costs including attorney's fees and witness costs (at both trial and appeal level, whether or not a trial or appeal ever takes place) that may be asserted by any person or entity arising from, during or in connection with the performance of the work described in this contract, except liability arising out of the sole negligence of either party and its employees. Such indemnification shall also cover claims brought against either party under state or federal workers' compensation laws. If any aspect of this indemnity or the above warranty shall be found to be illegal or invalid for any reason whatsoever, such illegality or invalidity shall not affect the validity of the remainder of this indemnification or the above warranty.

SERVICES

1. REPUBLIC SERVICES agrees to provide:
    a. Payment in the contracted amount as specified above.
    b. Mutually agreed upon days, totaling a minimum of two a month for services performed.
    c. No cost to COUNTY for trash dumped at Coffin Butte Landfill when performing services, as outlined in this contract.

2. COUNTY agrees to provide:
   a. COUNTY agrees to provide a number not less than 4 individuals from the Benton County Sheriff's Work Crew for a period of two days a month at a minimum of 8 hour work days, that is mutually agreed upon to perform litter pick-up among agreed upon locations within Benton County Limits.
   b. To submit invoice to REPUBLIC SERVICES by 15th of month following the quarter of services performed as outlined in this agreement.

TORT CLAIMS

Within the limits of the Oregon Tort Claims Act, ORS 30.260 through 30.300, both parties and their employees or officers or agents are insured against any claim or claims for damages arising by; reason of personal injuries or death occasioned directly or indirectly in connection with the performance of, or failure to perform, any service provided hereunder, the use of any property and facilities provided by either party and activities performed by either party in connection with this Agreement.

GOVERNING LAW

This contract shall be governed and construed by the laws of the State of Oregon.

SEVERABILITY

If any term or provision of this contract is declared by a court of competent jurisdiction to be illegal or in conflict with any law, the validity of the remaining terms and provisions shall not be affected.

MERGER

This writing constitute the entire and final contract between the parties. No modification of this agreement shall be effective unless and until it is made in writing and signed by both parties.

METHOD AND PLACE OF GIVING NOTICE, SUBMITTING BILLS, AND MAKING PAYMENTS

All notices, bills and payments shall be made in writing and may be given by personal delivery, by mail or email, receipt requested. Notices, bills, and payments sent by mail should be addressed as follows:

COUNTY:	Benton County Sheriff's Office 180 NW 5th St. Corvallis, OR 97330
REPUBLIC SERVICES:	Republic Services Attn: Kevin Planalp, BU Finance Mgr. Hauling 110 NE Walnut Blvd Corvallis, OR 97330

When so addressed, shall be deemed given upon deposit in the United States Mail, postage prepaid. In all other instances, notices, bills, and payments shall be deemed given at the time of actual delivery. Changes may be made in the names and addresses of the persons to whom notices, bills, and payments are to be given by giving notice pursuant to this paragraph.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be executed by their officers thereunto duly authorized.

DATED this 8th day of June, 2023.

Republic Services

Printed Name Bret J. Davis

Title General Manager

Benton County Sheriff's Office

Jef Van Arsdall, Sheriff

Approved as to form:

County Counsel/Date 6-7-23

BENTON COUNTY
ADDENDUM TO CONTRACT WITH
VALLEY LANDFILLS, INC.

("Franchisee"), a wholly owned subsidiary of Waste Control Systems, Inc., called Republic Services referred to as CONTRACTOR, is made and entered into this 1st day of July 2023.

1. Addendum number 1 to original agreement number 503603 between Benton County and Valley Landfills, Inc. a wholly owned subsidiary of Waste Control Systems, Inc., called Republic Services.
2. The contract entered into on July 1, 2023, between COUNTY and CONTRACTOR shall be amended as follows:
   - A. **PAYMENT OF SERVICES:** Contracted services will be for a minimum of four days per month totaling thirteen thousand four hundred and forty dollars ($13,440.00) per quarter. The amount may be prorated based on start date of added services.
   - B. **SERVICES:** 1. B. Mutually agreed upon days, totaling a minimum of four a month for services performed. 2 a. County agrees to provide a number not less than 4 individuals from the Benton County Sheriff's Work Crew, when possible, for a period of four days a month at a minimum of 8-hour work days, that is mutually agreed upon to perform litter pick-up upon locations within Benton County limits.

It is understood by the parties that all conditions and agreements in the original contract, except those specifically referred to in this contract extension, shall remain in force during the entire contract extension period.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be executed by their officers thereunto duly authorized.

CONTRACTOR	COUNTY
Signature [signature] Date 1/3/25	Signature [signature] Date
	Jef Van Arsdall, Sheriff
Printed Name Brett J. Davis	Approved as to form:
Title General Manager	Vance M. Croney 2-6-2025
	County Counsel/Date

From:	Joel Geier
To:	Benton Public Comment
Subject:	LU-24-027 Coffin Butte Landfill expansion: Response to new evidence (expectations and commitments)
Date:	Wednesday, July 16, 2025 12:44:02 PM
Attachments:	Geier_04_PurchaserExpectations.pdf Geier_05_RepublicEmployeeCommitments.pdf

Dear Chair Fowler, Vice Chair Hamann, and Planning Commissioners Biscoe, Cash, Fulford, Lee, Struthers, and Wilson:

Thank you for your continuing attention to the complex issues surrounding this application.

The attached documents will be the 4th and 5th of 8 submissions which I'm sending in response to new evidence presented at the July 8-9th hearing.

These cover the following topics:

4) reasonable expectations for land owners when purchasing property in the impacted area
5) unreliability of applicant's "employee commitments" to reduce noise impacts on neighboring properties

Yours sincerely,
Joel Geier
38566 Hwy 99W
Corvallis OR 97330-9320

Issue:

A proponent of this application suggested in written testimony that adjacent landowners likely to be impacted by this development "should not be surprised at the expansion proposal." This is plainly contradicted by other evidence on the record, including a historical summary in the Benton County Talks Trash (BCTT) report as well as by written testimony submitted by a better-informed resident who has been engaged on landfill issues as a county volunteer for decades.

New evidence offered by proponent:

Mr. Brent Pawlowski (07092025_PAWLOWSKI_Brent" (Munidocs, 9. New Evidence from July 8-9 Hearings, Item #15) includes this personal recollection:

> *I toured the landfill over 35 years ago and it was communicated even back then that the long-term plan was to expand the landfill. This was no secret to the public or to any real estate buyer. Those who bought property near the landfill should not be surprised at the expansion proposal.*

Response:

"Over 35 years ago" would mean before July of 1990. Thus Mr. Pawlowski's recollection is from before VLI's 1994 CUP application to expand Coffin Butte Landfill. The Benton County Talks Trash report, which has been previously entered into the record, states on p. 33:

> *[I]n 1994, Valley Landfills filed another CUP, seeking to rezone 26 acres it owned from rural residential for use as a landfill, as part of its long-term planning efforts. ... As reported in the Gazette Times on November 3, 1994, this request encountered stiff opposition when local landowners cited concerned over smell, noise, groundwater contamination while other county residents wondered how large the county would let the landfill grow and whether increased capacity would affect the incentives to reduce consumption or recycle. About 50 people attended a Board of Commissioners' meeting in early November.*
> *The residents' perspectives in 1994 are similar to those in the 2020s. Community members argued that approval of the expansion by the County Commission after the extensive negative public testimony would show a lack of concern about what the community thinks. Specific concerns focused on the potential impact on springs and water supplies, that the change would be an exception to our state land-use goals, and how it could set precedent for even more massive change in waste disposal in the future.*
> *Newspaper archives indicate that numerous residents wrote letters to the editor, authored op-eds or said they were concerned that: 1) eventually the county would have to close Coffin Butte Road, a critical emergency route; 2) they had existing concerns about traffic, noise, smells, and roadside litter; and 3) that potential earthquake damage to landfill liners could cause contaminants to seep into the underground water supply.*
> *After delaying the vote at an earlier date, in a December 14, 1994 hearing, the Board of Commissioners unanimously denied the expansion. An article in the Albany Democrat-Herald reported that Commissioner Pam Folts said the Willamette Valley is not a good place for landfills because the high amount of rainfall can cause leachate to reach groundwater.*

From this account (which is supported in the BCTT report by contemporary newspaper accounts), it's clear that residents who lived near the landfill in 1994 did not accept the plan to expand the landfill.

They, along with any residents who purchased property in the area after 1994, would have had reasonable grounds to believe that this matter had been settled by the County's 1994 decision.

A more reasonable assumption would be that the County would stand by its decision. The concern voiced by Commissioner Folts, that a landfill in this area could put groundwater at risk from leachate, remains an issue of concern.

Dr. Jeffrey Morrell, who served on the served on the Solid Waste Advisory Committee (SWAC) and the Disposal Site Advisory Committee (DSAC) for more than 16 years, has previously testified as part of the record for LU-24-027:

> *... for the entire time I served on the SWAC and DSAC, we were continually told that the landfill had decades of capacity and had no intention to cross the road. We were also told that the land to the south was purchased as buffer, not destined to be active landfill*

Dr. Morrell has a significantly longer demonstrated record of informed engagement with landfill issues than Mr. Pawlowksi. Mr. Pawlowski only joined SWAC and DSAC in November 2022 and did not attend a regular meeting of either body until late 2023 (because regular meetings of DSAC and SWAC were suspended in favor of the BCTT process for most of a year).

Mr. Pawlowski's assertions on this topic should therefore be disregarded as poorly informed.

Issue:

VLI asserts that they have received a "commitment from Republic employees," as part of their proposed method to reduce noise impacts on adjacent properties.

VLI has not provided any evidence of such a commitment, nor can this be considered credible in view of their parent company's record of recent and ongoing labor disputes.

New evidence:

Republic's slide deck for July 8th, slide 7 (Republic slide deck): "This Application Reflects: ... A commitment from Republic employees ... to operate responsibly and respectfully."

Response:

VLI/Republic Services offers this "commitment" as assurance regarding noise, as part of their assurance that they can reduce noise levels and their impact on use of adjacent properties.

Neither VLI nor Republic Services have not provided any documentation of such a commitment from their employees, as part of the evidentiary record. If any of their employees have voluntarily submitted statements affirming such a commitment to the record, we are unaware of it.

We note that VLI is the applicant, but they only have a small number of employees, only a few of whom are operating equipment that is likely to produce noise on the site. Republic Services, which owns VLI, is not formally the applicant. Their operations include many trucks who haul garbage and other waste to Coffin Butte, from near and far, but the operators of those trucks are not employed by the formal applicant for this CUP.

VLI has a long-running and unresolved labor dispute with Operating Engineers Local 701, the members of which are responsible for maintenance of heavy equipment on the landfill (including upkeep the machinery identified as the most noisy, by VLI's noise consultants). The following headlines with links give a quick overview of the issue:

Oct 13, 2023: **Union leaders, House Speaker show support for Coffin Butte mechanics at rally**
https://gazettetimes.com/news/local/business/employment/article_abb4c5f2-6951-11ee-b1de-e7cb9266d4ca.html

Dec 15, 2023: **Still no deal after Local 701 ends strike at Corvallis landfill**
https://nwlaborpress.org/2023/12/still-no-deal-after-local-701-ends-strike-at-corvallis-landfill/

Apr 16, 2024: **Coffin Butte Landfill given citations after worker complaints**
https://www.statesmanjournal.com/story/news/local/oregon/2024/04/16/coffin-butte-landfill-worker-complaints/73205605007/

You've received testimony from a local whistleblower, Mr. Robert Orton, based on his experiences related to that dispute. In contrast, not a single VLI or Republic employee, other than company executives, managerial staff, and paid consultants, showed up to testify in support of this application. Even in the written record, support from employees is conspicuously lacking.

Regarding the parent company, Republic Services, which employs many of the truck drivers who haul garbage to Coffin Butte, we note that the International Brotherhood of Teamsters have just launched a nationwide strike:
https://teamster.org/2025/07/teamsters-to-republic-services-end-subpar-compensation-to-resolve-strike/

The Teamsters website quotes their General President Sean M. O’Brien as saying:

> *“Republic Services has been threatening a war with American workers for years — and now, they’ve got one. Republic abuses and underpays workers across the country. They burn massive profits and funnel money to undeserving, corrupt executives.”*

Teamsters General Secretary-Treasurer Fred Zuckerman adds:

> *“This company is one of the most depraved employers we’ve ever come across. Republic has lied, stalled, and broken the law to try to squeeze every last dime out of workers.”*

(source: https://teamster.org/2025/07/teamsters-go-to-war-against-republic-services/)

These are obviously strong and provocative statements, emerging from a nationwide labor dispute. But they align with local whistleblower testimony, as you have heard.

In the context of this land-use decision, the relevant question is this:

> ***Is Republic Services' assurance of a "commitment" from their employees, to help them meet Conditions of Approval regarding noise, at all credible?***

Republic's current nationwide labor problems indicate that this claimed "commitment" is not at all credible. This is a company that clearly doesn't have its own house in order, with regard to their employees.

Given the lack of evidence in support, and significant evidence to the contrary, you shouldn't believe the company's statements regarding any employee "commitments" which they've completely failed to demonstrate. This also reflects poorly on their other commitments to our community.

From:	Joel Geier
To:	Benton Public Comment
Subject:	LU-24-027 Coffin Butte Landfill expansion: Response to new evidence (heron buffers)
Date:	Wednesday, July 16, 2025 1:51:57 PM
Attachments:	Geier_6_HeronBuffer.pdf

Dear Chair Fowler, Vice Chair Hamann, and Planning Commissioners Biscoe, Cash, Fulford, Lee, Struthers, and Wilson:

The attached document is my 6th of 8 planned submissions which I'm sending in response to new evidence presented at the July 8-9th hearing.

This covers the following topic:

6) Buffers for protecting sensitive Great Blue Heron nesting areas

Although the applicant has lately acknowledged a new active nesting area less than 1/4 mile from areas where they propose substantial excavation and various infrastructure development on Forest Conservation Land, they have failed to revise their plans accordingly. This follows a long-standing pattern by the applicant (as documented in previous testimony) of failing to avoid disturbance to these nesting birds, as required by both state and county.

Thank you once again for your careful consideration of the issues.

Yours sincerely,
Joel Geier
38566 Hwy 99W
Corvallis OR 97330-9320

Issue:

The applicant's submittals, together with Conditions of Approval recommended by staff as presented on July 8th, do not take any account of protections required for Great Blue Heron in their currently active nesting area in an ash grove adjacent to Forest Conservation lands on which applicant proposes substantial excavation including blasting. Development sequence plans as presented on July 8th are not compatible with the required protections for this species, which is recognized as sensitive by both state and county statute.

New evidence:

Staff slides to Planning Commission LU24027 July 8, slide 30 refers to construction in reference to known Great Blue Heron Nesting areas:

> *COAs P2-3(A-C) and OP16(A-C) require annual monitoring active rookeries, identification of 300-foot buffer, and prohibit construction during critical nesting period.*

The slide includes a map of the expected 300-foot buffer area, reproduced here as Figure 1. Based on Staff's presentation July 8th, this map is being endorsed by Staff for adoption as part of this Condition of Approval.

Figure 1: Proposed 300-ft buffer for protection of east rookery (poplar grove).

Staff slide 41 further states:

> ***P2-3 Active Rookery Protection.***
>
> *(B) Applicant shall identify a buffer of 300 feet around the primary nest zone of active rookeries and limit activities to maintain alternate nest trees, allow for growth of the colony, protect against windthrow, and prevent harassment.*
>
> *(C) Applicant shall not engage in major construction within a quarter mile of an active rookery during the critical nesting period from February 15 through July 31.*

Response:

Figure 1 shows only a 300 ft buffer extending west and south of the heron nesting area in the poplars (Heron Rookery #2716, also referred to in application documents as the "east rookery), but truncated to the east and north.

The corresponding quarter-mile zone, within which the applicant "shall not engage in major construction" during the critical nesting season identified as February 15 through July 31, is not shown on this map. If shown, it would clearly impinge on the footprint of the proposed new landfill (just west of the N-S running road in the map).

Applicant's map, as adopted by county staff, also ignores the new heron nesting area which has been documented just across Hwy 99W, at the east edge of this map.

This nesting area (referred to as the "ash grove nesting area" or rookery) has been thoroughly documented in written testimony submitted by Joel Geier and affirmed by Oregon Department of Fish and Wildlife (e-mail from Gregory Reed submitted to public comments for this application).

Lately the applicant has also acknowledged this nesting area, but they have not incorporated any buffers for its protection into their development plan or the description of their construction sequence.

Figure 2 shows a sketch of the area extending a quarter mile from the currently active heron "ash grove" nest area, compared to approximate locations of leachate ponds and a new sump (shaded in orange) and associated excavations, as well as proposed new truck scales and new entrance.

Note that the excavation area for both of the proposed new leachate ponds lies within a quarter mile of the new "ash grove" nesting area.

Applicant's presentation regarding construction sequence (see my separate submission on Construction Impacts) stated that pond construction would happen early in the site development process. Applicant's verbal testimony indicated that this would take place during a 6- to 8-month interval, apparently in the dry part of the year.

In order to avoid blasting and other "major construction activity" (note this is poorly defined in the Conditions of Approval), this activity would need to be restricted to the period from August 1 through December 31, which would be reduced to a 2-month period (August-September) if the rainy season is to be avoided. Applicant has not given any indication of how they plan to handle this constraint.

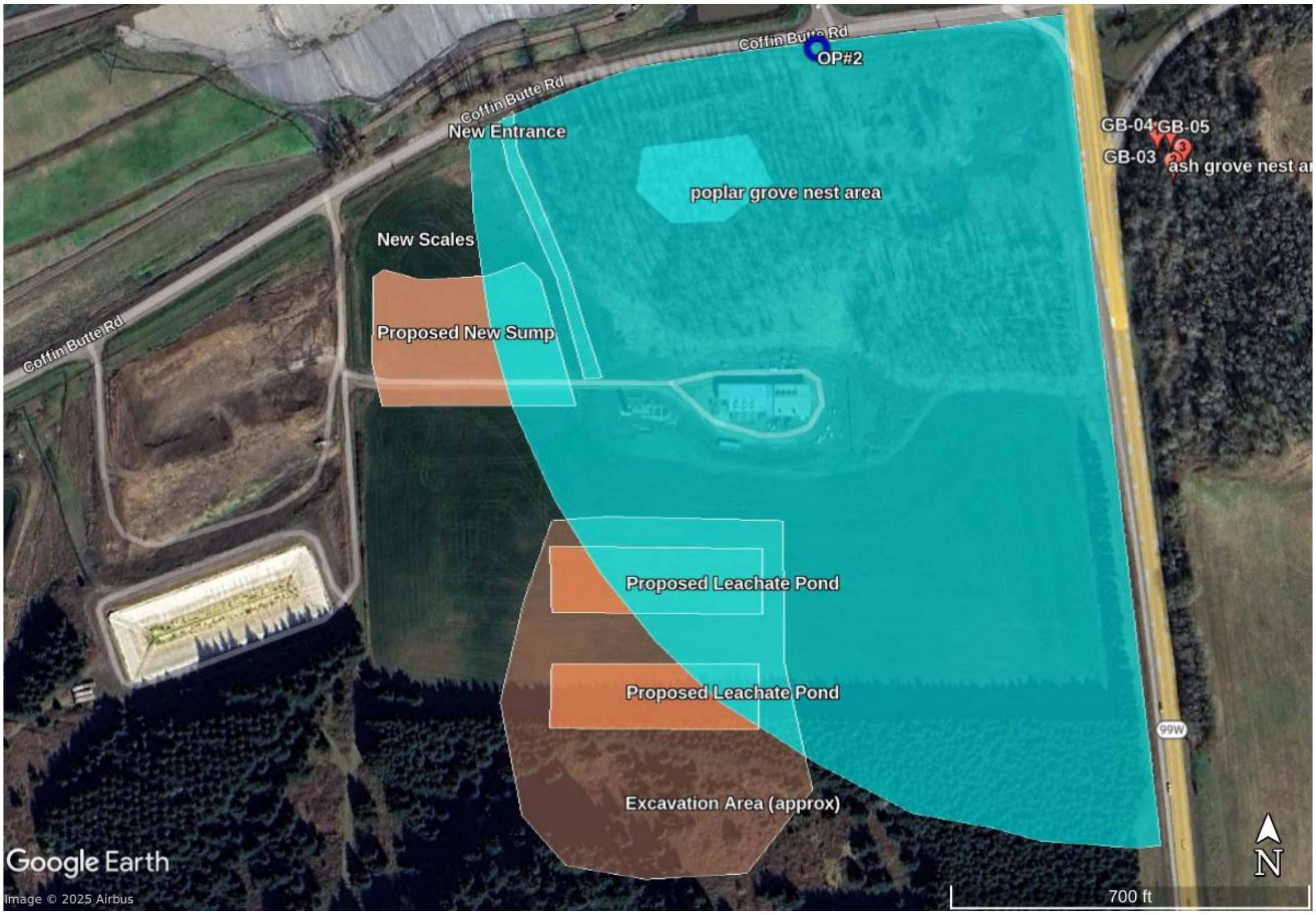


Figure 2: Quarter-mile buffer from currently active heron "ash grove" nest area (still active as of July 15, 2025), shaded in blue, compared to approximate locations of leachate ponds and a new sump (shaded in orange) and associated excavations, as well as proposed new truck scales and new entrance.

Note also that the proposed new entrance is also within the 300-ft buffer proposed by the applicant, as well as a new utility corridor which might require tree removal for maintenance, contrary to the proposed Condition of Approval.

From all of the above, it is clear that the applicant has not given serious consideration or presented any clear plan for how their development plans will prevent disturbance to this sensitive and state-protected species in their new nesting locations. This is one more reason to deny this application.

From:	Joel Geier
To:	Benton Public Comment
Subject:	LU-24-027 Coffin Butte Landfill expansion: Response to new evidence (PFAS to WWTP)
Date:	Wednesday, July 16, 2025 3:41:38 PM
Attachments:	Geier_7_PFAStoWWTP.pdf Geier_7_PFAStoWWTP Annex 1 PFAS Phase II Report_FINAL_6.26.25.pdf

Dear Chair Fowler, Vice Chair Hamann, and Planning Commissioners Biscoe, Cash, Fulford, Lee, Struthers, and Wilson:

The attached document is my 7th of 8 planned submissions which I'm sending in response to new evidence presented at the July 8-9th hearing.

This covers the following topic:

6) PFAS a.k.a. "forever chemicals" in leachate shipments to wastewater treatment plants (WWTPs)

There appears to be a math error close to a factor of 100, in the information that was provided to you by the applicant. As an annex, I've included the full Riverkeeper report which I also mentioned in my testimony on July 9th.

I do hope that the following will make the numbers and proportions easier to comprehend in real-life terms:

Imagine that, every other day, you go out to your front porch to find that the applicant has delivered 3 gallon jugs (like milk jugs) to your front porch, filled with a murky-looking liquid, with a note asking you to kindly pour the contents down your kitchen sink or your toilet, whichever you prefer.

That, in effect, is what the applicant has been asking the City of Corvallis to do for years. The applicant has hinted that they might find some other town willing to do that for them, but they haven't said who.

Thank you once again for your careful consideration of the issues. Again, I urge you to deny this application.

Yours sincerely,
Joel Geier
38566 Hwy 99W
Corvallis OR 97330-9320

Issue:

VLI has presented inaccurate information on leachate as a fraction of wastewater treated in Corvallis. The stated percentage is too low, by roughly a factor of one hundred. This gives a false impression of the significance of leachate being effectively passed through to the Willamette River, particularly in regard to the high concentrations of PFAS and heavy metals.

Statements by VLI that concentrations of these pollutants are "similar to other landfills" are cause for concern rather than cause for comfort.

In simple terms explained below, leachate shipments to Corvallis amount to roughly one and a half gallon jugs of highly contaminated water, per household per day. That shouldn't be downplayed.

New evidence:

Republic's slide deck for July 8th, slide 16 includes the following bulleted statements:

> *• PFAS concentrations measured in Coffin Butte Landfill leachate samples are similar to PFAS concentrations measured in a USEPA study of landfill leachate and in leachate samples collected from California MSW landfills.*
>
> *• Currently there is no formal requirement to monitor PFAS in leachate or groundwater.*
>
> *• The amount of leachate treated at the City of Corvallis' WWTP **represents 0.0058% of water treated by the WWTP**.*
>
> *• Metals concentrations in Coffin Butte leachate are similar to those at other MSW landfills, according to data published by USEPA.*

Response:

There is a major (nearly a factor of 100) error in the applicant's assertion that landfill leachate represents just 0.0058% of the wastewater treated by the City of Corvallis's wastewater treatment plant (WWTP).

> *• The amount of leachate treated at the City of Corvallis' WWTP **represents 0.0058% of water treated by the WWTP**.*

The City of Corvallis website (Figure 1) states that the WWTP processes "over 4 billion gallons of wastewater a year."

Table 4-11 of the 2024 Annual Environmental Monitoring Report (AEMR) for Coffin Butte, as submitted to DEQ, states that for the 12-month period from October 2023 through September 2024, VLI shipped 20,301,148 gallons of leachate to the Corvallis WWTP.

Using round numbers:

(20 million gallons leachate) / (4 billion gallons wastewater) = 0.50%

PUBLIC WORKS

Wastewater Treatment

The City of Corvallis operates one wastewater treatment plant, maintains over 200 miles of wastewater collection pipes, and treats over 4 billion gallons of wastewater a year. The sanitary sewer system is a gravity system, which uses eight pump stations to move the wastewater from lower elevation portions of the system to the treatment plant located at NE 2nd Street. The treated wastewater goes through a rigorous series of tests to assure water quality is not compromised as it is discharged back to the Willamette River. Biosolids (or sludge), a byproduct of the treatment process, are stored and recycled each summer as a soil amendment to agricultural fields. For a tour of the wastewater treatment plant, call 541-766-6934.

Figure 1: Screen shot of the City of Corvallis wastewater treatment plant web page as of July 12, 2025, documenting the amount of wastewater treated annually as "over 4 billion gallons per year."

If they shipped 23 million gallons to Corvallis last year (possibly not yet reported to DEQ) , that would be:

(23 million gallons leachate) / (4 billion gallons wastewater) = 0.58%

We suspect that the error in the applicant's slide is the result of a simple mathematical error by their consultants, or perhaps a misunderstanding of the difference between decimal fractions and percentages, rather than willful deception.

Either way, it doesn't give great confidence in the level of care that goes into their methods of handling, interpreting, and presenting data that are highly relevant for assessing risks to human health and the environment.

To put this into simple terms, a typical US household uses about 300 gallons of water per day. 0.50% of that would be 1.5 gallons of leachate per household, per day.

Imagine if, every other day, this company delivered three gallon jugs of leachate to your doorstep and asked you to kindly pour it down your toilet. That's effectively what they've been asking the City of Corvallis to do, on their behalf.

We agree with the applicant that PFAS concentrations in leachate from Coffin Butte Landfill are similar to other MSW landfills. We obtained leachate PFAS data by public records requests from the City of Corvallis and Clean Water Services (original data available in spreadsheet form on request), to compare Coffin Butte with two other landfills in western Oregon (Hillsboro and Riverbend).

For three of the six categories of regulated PFAS, Coffin Butte leachate appears to be worse than both Riverbend and Hillsboro, but lies near the middle of the range for the other three categories. All of them are far above the EPA's regulatory standards for drinking water, by factors of up to several orders of magnitude.

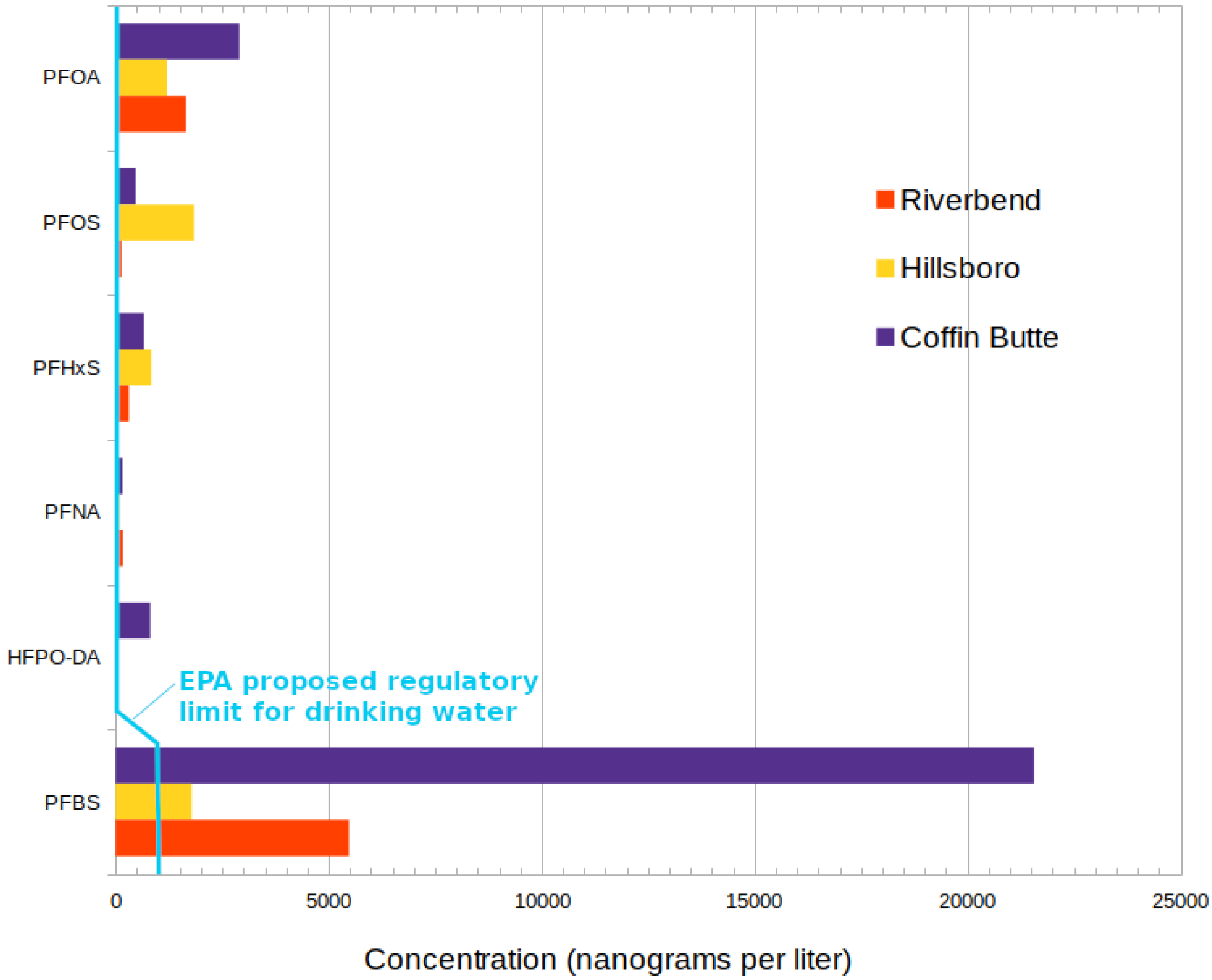


Figure 2: PFAS in leachate from three landfills in western Oregon (averages calculated over multiple samples for each of the three landfills, for the six types of PFAS now regulated by the USEPA (the "proposed" regulatory limits shown in the figure were adopted last year).

The implications of these high concentrations in leachate are just beginning to be understood. In my verbal testimony on July 9th, I included a handout from the recently released Riverkeeper report on PFAS inputs to rivers (included here as Annex 1). Data from the Tualatin River upstream and downstream of the Hillsboro WWTP show that this is a major point source of PFAS inputs to that river. At least two other WWTPs that accept landfill leachate, in other states, were found to be among the 10 worst WWTPs for PFAS pollution in the country.

No WWTPs on the Willamette River were included in that study, but it should be anticipated that the high PFAS load from Coffin Butte Landfill could affect the Willamette River below both the Corvallis WWTP and the Willow Creek WWTP in Keizer/Salem.

Similarly we agree that heavy metals concentrations in leachate from Coffin Butte are similar to other MSW landfills. That is not a favorable comparison. We also note that Coffin Butte has not presented data for mercury in leachate, at least since 2021.

WATERKEEPER® ALLIANCE

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PFAS Report Phase II

UNCOVERING PFAS CONTAMINATION IN FRONTLINE COMMUNITIES

TABLE OF CONTENTS

ACKOWLEDGMENTS

This report was produced by Waterkeeper® Alliance, New York, N.Y., in cooperation with Hispanic Access Foundation, Washington, D.C., and participating Waterkeeper groups from across the United States. Data and technical findings were supplied for the sole purpose of this report by the contracted service provider, SiREM Lab, Guelph, Ontario and Eurofins Environmental Testing USA, Sacramento, Calif. The SiREM Lab report containing all sample results can be accessed at waterkeeper.org/pfas. Analysis for the report was provided by Dr. Elizabeth Southerland, Ph.D., former Director of the U.S. Environmental Protection Agency (EPA) Office of Science and Technology in the Office of Water and Robert W. Bowcock, Founder and Managing Director of Integrated Resource Management. A third-party scientific review was provided by Dominique Lueckenhoff, Executive Vice-President, at Hugo Neu Corporation and a former water program official with EPA and Laura Orlando, Senior Scientist at Just Zero. The monitoring project that led to the creation of this report was designed and implemented by Kelly Hunter Foster, Senior Attorney for Waterkeeper Alliance and Christian Breen, Waterkeeper Membership Services Manager for Waterkeeper Alliance. Kelly Hunter Foster and Katie Horner, Legal Fellow for Waterkeeper Alliance, also contributed watershed, facility, and data evaluations for the report. Kate Mulligan and Veronica Navarro from Michigan Law School provided copyedit and feedback support.

ABOUT WATERKEEPER ALLIANCE

Waterkeeper Alliance is a global movement uniting more than 300 community-based Waterkeeper groups around the world, focusing citizen action on issues that affect our waterways, from pollution to climate change. The Waterkeeper movement patrols and protects nearly six million square miles of rivers, lakes, and coastlines in the Americas, Europe, Australia, Asia, and Africa.

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180 Maiden Lane, Suite 603, New York, N.Y. 10038

EXECUTIVE SUMMARY

This report presents novel, targeted data from a monitoring project focused on locations near wastewater treatment plants (WWTPs) and permitted biosolids land application sites—suspected contributing sources of per- and polyfluoroalkyl substances (PFAS) to waterway contamination. The findings confirm that PFAS contamination is both widespread and persistent, reinforcing the urgent need for stronger regulations, expanded research, increased funding, and improved treatment technologies. This work adds timely, critical insight to the growing understanding of PFAS pollution, especially in frontline communities already facing disproportionate environmental and health burdens.

PFAS are a class of manufactured organic chemicals pervasive in the environment and linked to harmful public health and ecosystem impacts. Often referred to as "forever chemicals" because they do not break down or do so very slowly,[1] PFAS have been widely used in various industrial and consumer products since at least the 1950s. As a class of chemicals, there are approximately 15,000 different derivatives[2] that share similar molecular structures, environmental characteristics, and biological hazards. These toxic compounds are biopersistent, bioaccumulative, and pose serious health risks, including cancer, reproductive and developmental effects, immune system dysfunction, and hormonal disruption.[3]

Largely unregulated by EPA and many state agencies, PFAS are widely released from sources such as industrial wastewater, landfill leachate, and effluent, sewage sludge, and biosolids from wastewater treatment processes. As a result, PFAS have contaminated the environment, including both groundwater and surface water used for drinking.[4] When sewage sludge is treated to meet EPA regulatory standards and is intended to be land applied as a soil conditioner or fertilizer on agricultural, forested, and other lands, the agency typically refers to it as biosolids (Class A or B). Untreated or partially treated sewage sludge may be incinerated or disposed of in landfills—in dedicated monofills or co-disposed with municipal solid waste sites.[5] Biosolids often contain PFAS but the federal regulatory standards and treatment process are not sufficient to control these pollutants.

The pervasiveness of this contamination intensifies the potential harm to the environment and human health when facilities do not adequately contain, treat, and dispose of PFAS-contaminated wastewater and sewage sludge. These facilities[6] can receive PFAS in wastewater from residential, commercial, and industrial sources that produce, manufacture, or use products that contain PFAS.[7] As centralized collectors, WWTPs face significant challenges due to underfunding and the limitations of traditional treatment technologies. These technologies are not designed to remove or destroy compounds characterized by strong carbon-fluorine bonds and resistance to degradation. As a result, these substances are discharged into receiving surface waters through effluent or transferred through contaminated sewage sludge and biosolids. While PFAS are found in waterways across the country, their impacts are not equally distributed. Communities of color, low-income, and rural areas, which are often closer to sources of industrial pollution and have limited resources for water testing and treatment, face higher exposure risks and greater health vulnerabilities.

Despite decades of releasing PFAS into the environment, "few industrial facilities have PFAS monitoring requirements, effluent limitations,[8] or pretreatment standards[9] for wastewater discharges" because EPA has not adopted national requirements.[10]

Because industrial wastewater is not adequately regulated for PFAS, these chemicals often end up in sewage sludge, which is then processed into biosolids used on land. In 2022, EPA estimated that 56% of biosolids were land-applied for agriculture, reclamation, or other uses.[11] By 2023, that figure had risen to 60%, with 31% applied to U.S. agricultural land—an 11% increase from the previous year.[12] As a result, PFAS that are often present in biosolids have contaminated, and continue to contaminate, lands, livestock, waterways, and agricultural products across the country.[13]

The extent of PFAS contamination in U.S. surface waters was exposed in Waterkeeper Alliance's 2022 Phase I monitoring project, in which 113 Waterkeeper groups collected a total of 228 PFAS samples in waterways from 34 states and the District of Columbia (D.C.).[14] The results were striking: PFAS were present in 83% of the waterways tested, with at least one compound found in 95 out of 114 sites sampled. Of the 55 compounds analyzed, 35 were detected in 63.6% of the sites. Overall, measurable concentrations were found in waterways across 29 states and D.C., often at levels far exceeding EPA drinking water health advisory limits.[15]

Waterkeeper Alliance developed this Phase II water quality monitoring project to test surface waters for the presence of PFAS upstream and downstream from 22 WWTP sites and 10 biosolids land application fields in partnership with Hispanic Access Foundation and Waterkeeper groups in 19 states.[16] This project utilized cutting-edge SiREM PFASsive™ sampling techniques and state-of-the-art analytical methods at Eurofins Environment Testing Calscience laboratory in Sacramento, Calif. (EPA Method 1633[17]). The monitoring evaluated and quantified PFAS contamination from municipal wastewater and biosolids land application fields over time, with a focus on disproportionately impacted communities. To our knowledge, this is the first monitoring project that employed passive sampling devices at WWTP-associated sites in multiple states, producing more representative data on PFAS equilibrium concentrations.[18] By quantifying only dissolved PFAS contaminants, it provides a more accurate basis for bioavailability, toxicity, and risk assessment than conventional grab samples, which reflect total concentrations at a single timepoint. The resulting data enhances our understanding of PFAS migration pathways, bioavailability, and impacts in U.S. surface waters. It further demonstrates that treatment processes and land application methods play a critical role in the release of these contaminants into surface waters, highlighting both limitations in current practices and areas where contamination is occurring.[19]

This evaluation also helped identify sites across the country where stronger measures are needed to control source pollution from industrial dischargers as well as subsequent passthrough discharges from WWTPs and biosolids land application fields.

Our evaluation of the PFAS sampling results also makes clear that existing laws, regulations, and conventional wastewater treatment technologies are not adequately controlling, preventing, or remediating PFAS pollution in surface waters, exposing people and ecosystems to serious health risks.

PFAS are synthetic chemicals that have contaminated nearly every part of the environment and many aspects of daily life. These compounds were deliberately engineered to resist heat, water, and oil, making them extremely difficult to break down under natural conditions. As a result, they persist in the environment, bioaccumulate in humans and wildlife, and cycle through air, water, soil, and living organisms, threatening public health and ecosystems. Their widespread use and remarkable persistence have led to global contamination and an urgent need for regulatory action and cleanup.

Common household products containing PFAS.

CURRENT POLICY LANDSCAPE

The core federal law designed to control discharges of PFAS to surface waters is the Clean Water Act (CWA).[20] However, EPA has not adopted adequate regulations under the CWA to implement the law effectively and prevent this pollution.[21] For example, the agency has yet to adopt national PFAS water quality criteria to protect human health in surface waters[22] or establish Effluent Limitation Guidelines (ELGs), including pretreatment standards for industrial dischargers to wastewater treatment systems.[23] These regulations are central to placing limits on PFAS discharges through National Pollutant Discharge Elimination System (NPDES)[24] and industrial pretreatment permits.[25]

In October 2021, EPA released its PFAS Strategic Roadmap, outlining a whole-of-agency approach to addressing the toxic contaminants.[26] While progress on the development of federal PFAS actions and standards stalls, states across the country are grappling with this "contamination crisis,"[27] but state policies to address PFAS contamination are also limited and vary widely. Currently, at least 23 states have taken steps to address the problem through regulations, funding, and public health initiatives, though these measures are not yet comprehensive and vary widely in scope."[28]

In April 2024, EPA established legally enforceable Maximum Contaminant Levels (MCLs)—primary standards that apply to public water systems—for six PFAS compounds in drinking water under the Safe Drinking Water Act (SDWA).[29] In May 2024, the agency designated PFOA and PFOS as hazardous substances under CERCLA[30] (the Superfund law), enabling it to take cleanup actions and hold polluters accountable for costs.[31] The following December, EPA proposed draft human health water quality criteria (HHWQC) to limit PFOA, PFOS, and PFBS in surface waters.[32] While not yet finalized, these criteria represent concentrations which, if not exceeded, will protect the general population from adverse health effects due to ingesting water, fish, and shellfish. There is currently no proposed human health water quality criteria for other PFAS compounds.

In May 2025, EPA announced its intent to extend compliance deadlines for the PFOA and PFOS MCLs, establish a federal exemption framework, and rescind regulatory determinations for PFHxS, PFNA, HFPO-DA (GenX), as well as the Hazard Index mixture that includes PFBS.[33] These proposed changes do not have immediate legal effect and would require formal rulemaking, which could take years and likely face legal challenges.

Additionally, the agency has yet to establish numeric limits or monitoring requirements for PFAS in biosolids under Section 405(d) of the CWA,[34] despite being alerted to biosolids contamination by a major PFAS manufacturer as early as 2003.[35] Instead of taking regulatory action to address PFAS, EPA encouraged the use of biosolids as fertilizer, resulting in the widespread dispersal of the contaminants over millions of acres. The fertilizer industry estimates that farmers currently hold permits authorizing biosolid applications on approximately 70 million acres—about one-fifth of all U.S. agricultural land.[36]

Federal, state, and tribal governments must urgently monitor waterways, adopt enforceable standards to eliminate PFAS pollution sources, mitigate existing contamination, and, where authorized to regulate discharges, ensure compliance through permitting and enforcement. They must also prioritize funding for PFAS monitoring and the installation of advanced treatment technologies to protect impacted communities—especially those disproportionately affected by PFAS and other toxic pollutants. The scale of this contamination and its risks to public and environmental health demand strong and immediate regulatory action.

KEY FINDINGS

1. **The U.S. surface waters tested are widely contaminated by many different types of regulated and unregulated PFAS.**
   a. 98% of all surface water sampling sites tested upstream and downstream from WWTPs and biosolids land application fields in 19 states had one or more PFAS type detected, except for a single site downstream from a biosolids land application field in Wisconsin.
   b. More than half of the 40 PFAS chemicals that can be identified by EPA Method 1633 were detected in surface water samples upstream or downstream from WWTPs and biosolids land application fields.

2. **Wastewater treatment plants and biosolids land application field discharges can be significant contributors of multiple types of PFAS to U.S. surface waters.**
   a. The overwhelming majority of WWTPs evaluated lack enforceable PFAS limits in their CWA NPDES and other permits—both for discharges to surface waters and for biosolids applied to land application fields—underscoring the urgent need for regulatory standards to control these releases.
   b. 95% of downstream WWTPs sampling sites and 80% of downstream biosolids land application sites had elevated concentrations of multiple types of PFAS.
   c. Out of 40 types of PFAS that can be detected by EPA Method 1633, in comparison to PFAS levels detected at upstream sampling sites,[37] the sampling detected 19 types of PFAS at elevated levels downstream from WWTPs and 14 types of PFAS at elevated levels downstream from biosolids land application sites.

Elevated PFAS Levels	Detections Downstream from:	
	Wastewater Treatment Plants[38]	Biosolids Land Application Sites
PFHxA	19	6
PFOA	18	4
PFBS	17	7
PFPeA	17	6
PFHpA	14	6
PFHxS	14	3
PFOS	14	4
PFBA	12	7
PFNA	10	4

   d. Multiple types of PFAS were also frequently detected at high concentrations downstream from WWTPs located in areas with multiple indicators of environmental and health burdens on disproportionately impacted communities. For example:
      i. PFOA and PFOS were detected at the following concentrations in U.S. surface waters:

State	Waterbody	Concentration (ppt)	
		PFOA	PFOS
California	Santa Ana River	13	12
Florida	East Canal	7.1	11
Michigan	Rouge River	44	–
North Carolina	Haw River	10	23
	Cape Fear River	8.3	13
South Carolina	Pocotaligo River	28	30
Texas	Hunting Bayou	4	12

      ii. PFPeA was responsible for the greatest increases in PFAS concentrations downstream from nine WWTPs and five biosolids land application fields.
      iii. PFHxA was also responsible for the greatest increases in PFAS concentrations downstream from five WWTPs.

3. **Widespread detection of multiple PFAS types at upstream and downstream sampling sites confirms the need to regulate PFAS as a class to effectively limit exposure and address cumulative risks in U.S. surface waters.**
   a. Certain types of PFAS were frequently detected at multiple upstream and downstream sampling sites.
      i. The most commonly detected PFAS at sites associated with WWTPs were PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, and PFOS, which were all detected in 40 or more samples.
      ii. Some types of PFAS were often found to co-occur at individual sampling sites near WWTPs leading to higher overall exposures to total PFAS at those locations. For example, PFOS, PFHxA, PFOA, PFHxS, PFBS, PFHpA, PFPeA, PFBA, and PFNA were found to co-occur in 32 samples near WWTPs (and additional types of PFAS were often found at these locations as well).
      iii. Similarly, the most commonly detected PFAS at sites associated with biosolids land application fields were PFOA, PFBA, PFHxA, PFOS, PFHpA, PFBS, and PFHxS, each of which were detected in 19 or more samples.
      iv. Some types of PFAS were often found to co-occur at individual sampling sites near biosolids land application sites leading to higher overall exposures to total PFAS at those locations. For example, PFOA, PFBA, PFHxA, PFOS, PFHpA, PFBS, and PFHxA were found to co-occur in 16 samples near biosolids land application fields (additional types of PFAS were often found at these locations as well).
   b. The total downstream PFAS concentrations exceeded Environmental Working Group's (EWG) health-based criteria for protecting against human health harm caused by total concentrations of PFAS (1 ppt) at all 22 WWTP sites and at 9 of 10 biosolids land application sites.[39]
   c. The total PFAS concentration downstream from 17 WWTP sites and six biosolids land application sites increased, sometimes significantly, above total upstream PFAS concentrations. For example:
      i. In Oregon's Tualatin River, the total PFAS concentration increased from 0.97 ppt upstream to 30.02 ppt immediately downstream from the Rock Creek Water Resource Recovery Facility (WRRF)—a 2,994.85% increase.
      ii. In Washington's Dragoon Creek, the total PFAS concentration increased from 0.63 ppt upstream to 32.89 ppt immediately downstream from Spokane Riverside Park WRF's biosolids land application fields—a 5,120.63% increase.

4. **Current regulations fail to control PFAS pollution of U.S. surface waters, leaving communities at risk for toxic chemical exposure.**
   There are currently no federal surface water quality criteria or wastewater discharge limits for PFAS, and very few industrial dischargers are required to monitor or limit PFAS discharges into wastewater treatment systems—even though many industries contributing wastewater are likely handling, manufacturing, or using PFAS. At the time of sampling, PFAS concentrations downstream from WWTPs and biosolids land application fields often exceeded the current federal standards, including Safe Drinking Water Act (SDWA) MCLs, the draft HHWQC, and the EWG health-based standards referenced in this report.
      i. The elevated downstream samples were equal to or exceeded the PFOA MCLs at 12 downstream WWTP sites and two downstream biosolids land application sites.
      ii. The elevated downstream samples exceeded the PFOS MCL at nine downstream WWTP sites and two downstream biosolids land application sites.
      iii. An elevated downstream sample exceeded the PFHxS MCL at one downstream WWTP site. EPA has not developed MCLs for most PFAS.
      iv. The elevated downstream samples exceeded the draft HHWQC (Water + Organism) for PFOA at 18 downstream WWTP sites and four downstream biosolids land application sites and the draft HHWQC (Water + Organism) for PFOS at 14 downstream WWTP sites and four downstream biosolids land application sites. EPA has not developed HHWQC for most PFAS.
      v. Numerous EWG health-based criteria were exceeded in elevated samples from 29 locations downstream from WWTP sites and biosolids land application sites. PFOA, PFOS, PFHxS, and PFNA exceeded the criteria at the largest number of sites.

5. **SiREM PFASsive™ samplers provide an accurate method for conducting fresh surface water sampling for PFAS in locations that are impacted by discharges from wastewater treatment plants and biosolids land application fields.**
   These passive samples provide time-integrated data, giving a clearer picture of long-term contamination and PFAS bioavailability, toxicity, and risk—without the high cost and variability of daily or weekly grab samples. Waterkeeper groups successfully utilized the samplers across 19 states—producing results that are consistent and scientifically valid using EPA Method 1633.

WATERKEEPER ALLIANCE | PFAS REPORT PHASE II

METHODOLOGY

In April 2024, Waterkeeper Alliance, in collaboration with the Hispanic Access Foundation, initiated an extensive evaluation of selected watersheds previously sampled in the 2022 Phase I report. The goal was to identify WWTPs and biosolids land application sites that discharge near communities disproportionately impacted by environmental burdens, for more in-depth study. To determine these sites, the team utilized EPA's EJScreen—a publicly available tool that integrates demographic and environmental indicators to assess environmental justice concerns across communities nationwide.[40]

Watershed Selection

We initially identified 25 watersheds as high priority for participation in the PFAS Phase II monitoring project based on evaluations of the following criteria:

- Waterkeeper group participation in the Phase I project Reporting of a Phase I PFAS result greater than 10 ppt and reporting multiple PFAS detections greater than 3 ppt
- The presence of wastewater treatment facilities in proximity to the Phase I sampling site(s)
- The existence of a Phase I sampling site upstream or downstream from the WWTP
- The existence of approved industrial pretreatment and biosolids programs at the WWTP
- Multiple EPA EJScreen Indicators greater than the 80th percentile within 1 mile of the WWTP[41]
- The compliance history of the WWTP
- The inclusion of the WWTP in EPA's PFAS Influent Study[42]

Facility Selection

We then worked with Waterkeeper groups and Hispanic Access Foundation to finalize our selection of WWTPs and biosolids land application fields for sampling. Ultimately, we sampled 22 WWTP sites (25 WWTPs total) and 10 biosolids land application sites in 19 states. These sites were located in, or discharged upstream from, areas within the Waterkeeper group's watershed that, with limited exceptions, had multiple industrial users and where EPA EJScreen indicators were at or above the 80th percentile. The WWTP also had to discharge into a waterbody that could be sampled both upstream and downstream from publicly accessible locations or locations where access permission could be obtained. The selected biosolids land application fields were those that were associated with one of the selected WWTPs and either bordered a surface water or had ditches, streams, or other surface flow pathways to a nearby surface water that had accessible, representative upstream and downstream sampling locations.

Sampling Site Selection

Given the ubiquity of PFAS and the importance of isolating these compounds associated with the WWTP or biosolids land application field in the sample results for this project, particular attention was given to defining and locating upstream and downstream sample sites.

For the purposes of this project:

"Biosolids" are treated sewage sludge, the solid byproduct of the wastewater treatment process. They must meet EPA standards for land application or other beneficial uses, as outlined in 40 CFR Part 503. EPA classifies biosolids into two categories: Class A and Class B. Class A biosolids undergo treatment to eliminate pathogens and vector attraction, making them eligible for unrestricted land use under EPA standards, including for agriculture and landscaping. Class B biosolids are treated to reduce pathogens but may still contain detectable levels and are subject to restrictions, such as limiting public access and getting a permit to land apply. Both classes must meet requirements to address certain pollutants, including heavy metals, before being applied to land. At the time of publication, EPA has no standards or regulations for PFAS in biosolids.[43]

"Upstream" means a location on a waterbody that was above and not impacted by a pollution discharge from a targeted WWTP outfall or that was above a targeted biosolids application field. Upstream locations were generally placed at least 100 feet, but no more than one mile upstream above the outfall discharge point or biosolids application field. Waterkeeper Alliance and Waterkeeper groups conducted site-specific evaluations of sampling locations to identify representative locations and consider making modifications to the distance restrictions as necessary to ensure a sampling location was representative of conditions upstream from a WWTP or biosolids application field. Reasonable efforts were made to select accessible locations close enough to the outfall discharge point or biosolids application field to avoid as many other potential sources of PFAS pollution as possible.

"Downstream" means a location on a waterbody that was below a targeted WWTP outfall or below a targeted biosolids land application field and was designed to be representative of surface water quality downstream from the discharge, as opposed to directly capturing a sample of the WWTP effluent or biosolids application runoff. The downstream location was generally placed at least 100 feet, but no more than one mile below the outfall discharge point or biosolids application field. Waterkeeper Alliance and Waterkeeper groups conducted site-specific evaluations of sampling locations to identify representative locations and consider making modifications to the distance restrictions as necessary to ensure a sampling location was representative of conditions downstream from a WWTP or biosolids application field. Reasonable efforts were made to select accessible locations close enough to the outfall discharge point or biosolids application field to avoid as many other potential sources of PFAS pollution as possible.

The **discharge point for WWTP sampling locations** was determined based on the GPS coordinates for the location of the WWTP outfall. To select sampling site locations, Waterkeeper Alliance and Waterkeeper groups evaluated publicly available information to identify outfall discharge points to waterbodies. Using ArcGIS mapping and data analysis, field investigations, and other mapping tools, Waterkeeper Alliance and Waterkeeper groups then identified potential sampling sites on the waterbody that were located upstream and downstream of the WWTP outfall that were representative of waterbody conditions above and below the discharge.

The **discharge point for biosolids application sites** was the downstream boundary of the field or ditch, whichever was the furthest downstream, where it intersected the waterbody. To select sampling sites for biosolids application fields, Waterkeeper Alliance and Waterkeeper groups evaluated publicly available information to identify the field boundaries and any ditches, streams, or surface water flow paths on or near the field. Using ArcGIS, field investigations, and other mapping tools, Waterkeeper Alliance and Waterkeeper groups then identified potential sampling sites on the receiving waterbody that were located upstream and downstream of the biosolids application field, that were representative of waterbody conditions above and below the biosolids application field.

Sampling Method

Waterkeeper Alliance developed a Sampling and Analysis Plan for Phase II that includes a description of the project, criteria for selecting participating Waterkeepers and sampling sites, details for collecting and managing information and data, requirements for training personnel, details on project management, standards and protocols for the collection and analysis of surface water samples using SiREM PFASsive™ passive samplers, and a Quality Assurance Project Plan (QAPP) to ensure the collection of reliable and representative water quality data that meet the project's overall objectives and goals. Every effort was made to procure PFAS-free sampling equipment and supplies for the project and to avoid cross-contamination in the shipping and handling of passive sampling devices, equipment, and supplies. Waterkeeper groups also received training regarding best practices for avoiding cross-contamination while handling sampling devices, equipment, and supplies and during deployment, retrieval, transfer, and shipment of samples.

PFASsive™ passive samplers were used for quantification of the freely dissolved concentration (Cfree) of targeted PFAS analytes in sediment pore water, surface water, and stormwater. The PFASsive™ samplers are used to quantify the Cfree of dissolved PFAS in surface water via an in-situ deployment near WWTPs and biosolids land application fields. PFASsive™ samplers use a volume of laboratory-supplied clean water in a sampling device separated from water by a permeable membrane. Freely dissolved PFAS analytes in the water diffuse across the membrane until the concentration of PFAS inside equilibrates with concentrations of freely dissolved PFAS in the water. The sampling device is then removed from the deployment location. The water inside the PFASsive™ sampler is collected and analyzed like any other water sample using EPA methods.

Water Quality Data Collection

Waterkeeper Alliance conducted two training sessions for participating Waterkeeper groups in June 2024. The webinars included an overview of SiREM PFASsive™ technology, instruction on PFASsive™ sampling methodology and procedures, and equipment handling and shipping protocols. Upon completion of site selection and training, each Waterkeeper group received a box of sampling devices, equipment, and supplies from Waterkeeper Alliance via U.S. mail. Inside the box was a cooler with two or four sealed bags containing four PFASsive™ vials within each bag, two or four PFASsive™ frames, multiple

Table 1 | Sampled Watersheds and Wastewater Treatment Facility Sites

State	City or County	Waterkeeper	Facility	Receiving Waterbody	NPDES Permit No.	NPDES PFAS Effluent Limit
AL	Hoover	Cahaba Riverkeeper	Cahaba River Water Reclamation Facility (WRF)	Cahaba River	AL0023027	None
	Rainbow City	Coosa Riverkeeper	Rainbow City WWTP	Big Wills Creek	AL0056839	None
CA	Los Angeles	LA Waterkeeper	LA-Glendale Water Reclamation Plant	Los Angeles River	CA0053953	None
	Riverside	Inland Empire Waterkeeper	Riverside Regional Water Quality Control Plant	Santa Ana River	CA0105350	None
CT	Waterbury	Long Island Soundkeeper	Waterbury Water Pollution Control Facility	Naugatuck River	CT0100625	None
FL	Plant City	Tampa Bay Waterkeeper	Plant City WRF	East Canal	FL0026557	None
GA	Atlanta, Smyrna	Chattahoochee Riverkeeper	City of Atlanta's R.M Clayton WRC	Chattahoochee River	GA0039012	None
			Cobb County's R.L. Sutton WRF		GA0026140	
			West Area Water Quality Control Facility (WQCF)		GA0038644	
MD	Frederick	Potomac Riverkeeper	City of Frederick WWTP	Lower Monocacy River	MD0021610	None
MI	Detroit	Detroit Riverkeeper	Great Lakes Water Authority Water Resource Recovery Facility	Rouge River	MI0022802	Goal: PFOS 11 ppt; PFOA WQBEL 8,040 ppt
MS	Jackson, Richland	Pearl Riverkeeper	Jackson Publicly Owned Treatment Works (POTW), Savanna Street	Pearl River	MS0024295	None
			West Rankin Utility Authority WWTF		MS0061743	
NY/NJ	Rockland County, Hillburn	Hackensack Riverkeeper	Western Ramapo Advanced WWTP	Ramapo River	NY0270598	None
	Suffern		Suffern (V) Sewage Treatment Plant (STP)		NY0022748	None
NC	Fayetteville	Cape Fear Riverkeeper	Cross Creek WRF	Cape Fear River	NC0023957	None
	Graham	Haw Riverkeeper	Graham WWTP	Haw River	NC0021211	None
OR	Hillsboro	Tualatin Riverkeepers	Rock Creek WRRF	Tualatin River	OR0029777	None
RI	Cranston	Narragansett Bay Riverkeeper	Cranston WPCF	Pawtuxet River	RI0100013	None
SC	Sumter	Black-Sampit Riverkeeper	Sumter Pocotaligo River WWTP	Pocotaligo River, East Branch	SC0027707	None
TX	Houston	Bayou City Waterkeeper	Homestead WWTP	Hunting Bayou	TX0063029	None
VA	Petersburg	James Riverkeeper	South Central Wastewater Treatment Facility	Appomattox River	VA0025437	None
WA	Spokane	Spokane Riverkeeper	Spokane Riverside Park WRF	Spokane River	WA0024473	None
WI	Waukesha	Milwaukee Riverkeeper	City Of Waukesha WWTP	Root River	WI0029971	None
WV	Parkersburg	West Virginia Headwaters Waterkeeper	Parkersburg Utility Board	Ohio River	WV0023213	None
	Inwood Area	Upper Potomac Riverkeeper	Berkeley County PSSD–Inwood WWTP	Opequon Creek	WV0082759	None

Table 2 | Sampled Watersheds and Biosolids Land Application Fields

State	Waterkeeper	Facility	Biosolids Site Watershed	PFAS Limit
AL	Cahaba Riverkeeper	Cahaba River WRF (combined with Valley Creek WRF)	Cane Creek	None
	Coosa Riverkeeper	Rainbow City WWTP	Whippoorwill Creek	None
MD	Potomac Riverkeeper	Synagro Multi-WWTP Site *(inc. City of Frederick WWTP)* •	Monocacy River	Recommended Limits
MS	Pearl Riverkeeper	Jackson POTW, Savanna Street ••	Big Creek and Pearl River	None
NC	Cape Fear Riverkeeper	Cross Creek WRF	South River	None
	Haw Riverkeeper	Graham WWTP	Haw Creek	None
VA	James Riverkeeper	Synagro Multi-WWTP Site *(inc. South Central Wastewater Authority WWTF)* •	Old Town Creek	None
WA	Spokane Riverkeeper	Spokane Riverside Park WRF	Dragoon Creek	None
WI	Milwaukee Riverkeeper	City of Waukesha WWTP	Spring Creek (Fox River Watershed)	None – Statewide Interim Strategy
WV	Upper Potomac Riverkeeper	Berkeley County PSSD	Back Creek	None

• Synagro obtains biosolids from multiple WWTPs and, as a result, land application events may contain biosolids from one or more of those facilities.
•• Jackson POTW, Trahon and Big Creek WWTF also discharges to Big Creek above the confluence with Pearl River.

Eurofins 125 ml HDPE sample bottles, laboratory-provided labels, PFAS-free gloves, and PFAS-free storage bags. Waterkeeper groups designated to conduct duplicate or field blank sampling received additional vial bags and bottles. Sampling personnel conducting field blanks received two additional laboratory bottles. Sampling personnel conducting duplicates received two additional full sets of sampling supplies—vial bags, sample bottles, frames, ice packs, and other equipment.

One sampler was placed upstream of a WWTP and another was placed downstream from the same facility to evaluate discharges into the waterways.[44] In situations where the WWTP land-applied biosolids from its wastewater treatment process, and it was selected for sampling, the Waterkeeper group also placed one device upstream and another downstream from a biosolids land application field to evaluate PFAS discharged into the waterway as a result of this waste management practice.[45] Some Waterkeeper groups were also selected to collect duplicate samples or field blanks for quality control purposes. At the end of a deployment period of at least 20 days,[46] Waterkeeper groups were responsible for retrieving the device, completing field data sheets and chain of custody forms, and transferring the sample to Eurofins.

Laboratory Analysis and Equilibrium Calculations

Upon retrieval, samples, including laboratory, duplicates, and field blanks, were sent to Eurofins Sacramento for analysis using EPA Method 1633, including an M2PFOA tracer. Three sets of four vials (without frames) were also used as tracer blanks and sent directly to the analytical laboratory from SiREM for analysis. The tracer blanks are analyzed using EPA Method 1633 to confirm that the source PFASsive™ water is PFAS-free and to determine the initial tracer concentration for the samplers (required for equilibrium calculations).

Eurofins Sacramento's analytical results were reported first to SiREM Lab, which then completed equilibrium calculations prior to reporting the final results to Waterkeeper Alliance for further analysis and development of this report. Quantification of Cfree is dependent on the site-specific conditions surrounding each sampler that affect the sampling rates for each analyte. PFASsive™ uses an inert 13-C labeled PFOA (M2PFOA) tracer to evaluate the diffusion kinetics of the samplers during the exposure period. Cfree estimates of analytes that do not reach at least 10% of steady state concentrations in the sampler during deployment are reported with a qualifier. PFAS analytes were not expected to be qualified.

Data Quality

All of the data collected in this project were evaluated in accordance with a QAPP to evaluate whether the sampling produced quality data that is accurate, precise, complete, and representative, including:

1. adherence to consistent and reliable methods,
2. the analytical data meets data quality objectives (DQOs), and
3. the analytical data generated was reviewed, validated, and verified.

Although PFAS concentrations in surface water can be influenced by various factors—such as other discharges, atmospheric deposition, weather, and sampling timing—the upstream and downstream sites in this report were selected based on protocols designed to ensure representative sampling and minimize outside influences. Sites were placed near the discharge point or biosolids application area, and passive sampling over multiple days was used to reduce the impact of environmental variability. As a result, the findings are considered representative of PFAS impacts from wastewater treatment plant discharges and biosolids land application. While other influences cannot be entirely ruled out, there are no indications that they significantly affected the results given the study design. Other potential influences that we identified for a location, if any, are noted separately for each individual Waterkeeper group in the Evaluation of Facilities and Watersheds section of this report below.

As part of the review process, a Ph.D. scientist from SiREM evaluated all submitted data before modeling was performed and no abnormalities or flags reflecting on the reliability of the data were observed. The data evaluation and usability determination required by the QAPP confirmed that the data collected during this project accurately measured PFAS levels associated with the wastewater treatment facility and biosolids application field discharges identified for assessment and are suitable for use in the Project Report. The data evaluation, including any deviations from the Sampling and Analysis Plan, the assessment of Quality Control sample results, data assessment and laboratory qualifiers, and site condition impacts, is documented in the Data Evaluation and Usability Report. All Eurofins laboratory Result Qualifiers are shown in the Qualifier column next to the Results column in Appendix A; however, none of the qualifiers adversely impact the usability of the results for the purposes of this report.

Third Party Review

This report was submitted for third-party review with two experts to obtain an evaluation of the accuracy of the data and data analysis.

Table 3 | EPA Method 1633 Target Analytes

Analyte Description		CAS Number
ADONA	4,8-Dioxa-3H-perfluorononanoic acid	919005-14-4
FOSA	perfluorooctanesulfonamide	754-91-6
HFPO-DA (GenX)	Hexafluoropropylene oxide-dimer acid	13252-13-6
NEtFOSAA	N-ethyl perfluorooctane sulfonamido acetic acid	2991-50-6
NEtFOSE	N-ethyl perfluorooctane sulfonamido ethanol	1691-99-2
NEtFOSA	N-ethylperfluorooctane-1-sulfonamide	4151-50-2
NFDHA	perfluoro-3,6-dioxaheptanoic acid	151772-58-6
NMeFOSA	N-methylperfluoro-1-octanesulfonamide	31506-32-8
NMeFOSAA	N-methyl perfluorooctane sulfonamido acetic acid	2355-31-9
NMeFOSE	N-methyl perfluorooctane sulfonamido ethanol	24448-09-7
PFBA	perfluorobutanoic acid	375-22-4
PFBS	perfluorobutanesulfonic acid	375-73-5
PFDA	perfluorodecanoic acid	335-76-2
PFDoA	perfluorododecanoic acid	307-55-1
PFDoS	perfluorododecanesulfonic acid	79780-39-5
PFDS	perfluorodecanesulfonic acid	335-77-3
PFEESA	perfluoro(2-ethoxyethane)sulphonic acid	113507-82-7
PFHpA	perfluoroheptanoic acid	375-85-9
PFHpS	perfluoroheptanesulfonic acid	375-92-8
PFHxA	perfluorohexanoic acid	307-24-4
PFHxS	perfluorohexanesulfonic acid	355-46-4
PFMBA	perfluoro-4-methoxybutanoic acid	863090-89-5
PFMPA	perfluoro-3-methoxypropanoic acid	377-73-1
PFNA	perfluorononanoic acid	375-95-1
PFNS	perfluorononanesulfonic acid	68259-12-1
PFOA	perfluorooctanoic acid	335-67-1
PFOS	perfluorooctanesulfonic acid	1763-23-1
PFPeA	perfluoropentanoic acid	2706-90-3
PFPeS	perfluoropentanesulfonic acid	2706-91-4
PFTeA	perfluorotetradecanoic acid	376-06-7
PFTriA	perfluorotridecanoic acid	72629-94-8
PFUnA	perfluoroundecanoic acid	2058-94-8
9Cl-PF3ONS	9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53B major)	756426-58-1
11Cl-PF3OUdS	11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B minor)	763051-92-9
3:3 FTCA	3-perfluoropropyl propanoic acid	356-02-5
4:2 FTSA	4:2 fluorotelomer sulfonic acid	757124-72-4
5:3 FTCA	2H, 2H, 3H, 3H-perfluorooctanoic acid	914637-49-3
6:2 FTSA	6:2 fluorotelomer sulfonic acid	27619-97-2
7:3 FTCA	2H, 2H, 3H, 3H-perfluorodecanoic acid	812-70-4
8:2 FTSA	6:2 fluorotelomer sulfonic acid	39108-34-4

ANALYSIS AND FINDINGS

The Phase I PFAS monitoring project, undertaken with 113 U.S. Waterkeepers from across the country, was a first-of-its-kind nationwide survey of surface waters[47] that unequivocally demonstrated that dangerous PFAS pollution is widespread in surface waters across the country. In some locations, PFAS concentrations were thousands to hundreds of thousands times higher than what EPA experts say is safe for drinking water.

PFAS must be controlled and removed at their source in order to protect human health from these dangerous toxic chemicals, but this is not happening due to the lack of federal and state requirements for industrial dischargers and passive receivers like WWTPs and, particularly in disproportionately-impacted communities, the lack of funding to install advanced treatment systems to remove PFAS. Additionally, there are no state, tribal, and federal surface water quality or drinking water standards for most PFAS.

In 2024, EPA established legally enforceable limits for just six types of PFAS in drinking water, known as Maximum Contaminant Levels (MCLs) and proposed draft Human Health Water Quality Criteria (HHWQC) to limit three types of PFAS in surface waters.[48] At the time of publication of this report, EPA has not proposed drinking water or surface water limits for any other types of PFAS or any regulatory standards to address PFAS in biosolids.[49] Although EPA appears to have been aware of PFAS in biosolids since at least 2003, it has been reported that the agency actively encouraged the use of biosolids as fertilizer and it is estimated that farmers have obtained permits authorizing biosolids application on nearly 70 million acres of farmland, or about a fifth of all agricultural land in the U.S.[50] At the same time, states across the country are grappling with this "contamination crisis,"[51] but state policies to address PFAS contamination vary widely throughout the country.[52]

To address the urgent need for additional policy reform and scientifically sound data on PFAS sources and surface water contamination, Waterkeeper Alliance and Hispanic Access Foundation designed this Phase II PFAS monitoring project to work with U.S. Waterkeepers and partners. The project aims to evaluate and quantify PFAS contamination over time in surface waters using passive samplers placed near identified municipal wastewater treatment systems and biosolids application fields, with a focus on areas that appear to be disproportionately impacted based on the identification of EJScreen indicators above the 80th percentile. SiREM PFASsive™ samplers were selected for the project to provide an accurate representation of PFAS contamination present in the sampled surface waters and to be more reflective of bioavailability, toxicity, and risk than the data that would have been obtained through collection of a traditional single-day grab sample at each location.

Discharges from WWTPs and biosolids land application fields were indicated as a source of PFAS contamination in U.S. surface waters at nearly every downstream location we tested in 19 states, but we identified only one wastewater treatment system that has a limit on the amount of PFAS they could discharge into surface waters in their Clean Water Act NPDES permit, and we identified only seven facilities had a requirement to monitor their discharges for PFAS. *See Table 1 (p. 16)* and *Table 2 (p. 17)*. At least 22 of the 25 WWTPs where we sampled at WWTP sites received influent from one or more identified industrial users and many likely had additional industrial dischargers that the EPA has identified as "operat[ing] in sectors that have been identified as possibly handling, using, or releasing PFAS chemicals,"[53] but only one wastewater treatment system had a pretreatment program to place limits on the amount of certain PFAS that industrial users could discharge into its treatment plant.[54]

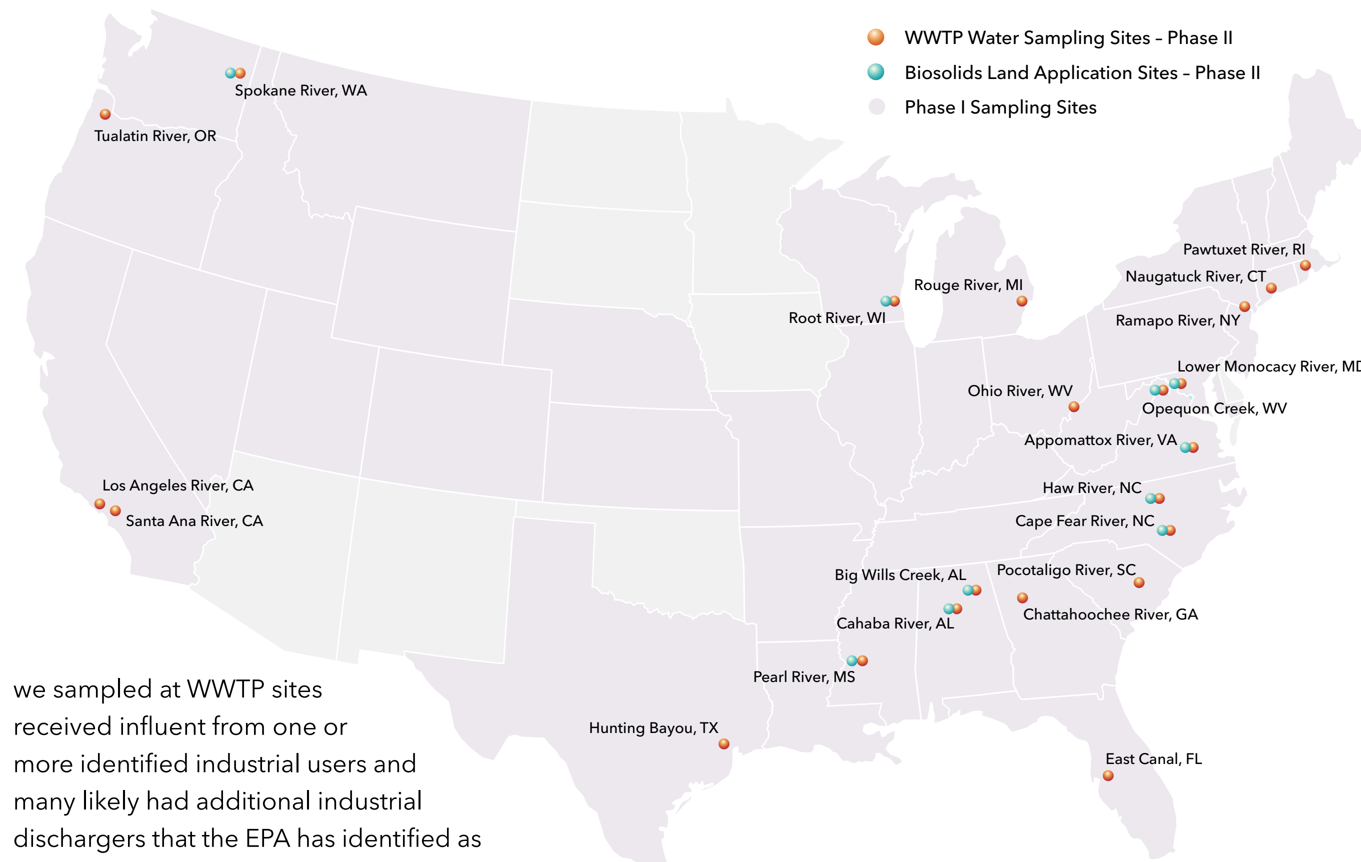
According to EPA, statewide surveys have found PFOS and PFOA in biosolids originating from industrial and non-industrial sources discharging to WWTPs across the country.[55] To the best of our knowledge, none of the WWTPs identified in this report have installed treatment technologies to remove PFAS from either their wastewater discharged to surface waters or their biosolids. Furthermore, the majority of the facilities we evaluated are not required to monitor or limit PFAS levels in biosolids prior to land application or other disposal methods for treated or untreated sewage sludge. Traditional wastewater treatment technology does not remove or destroy PFOS and PFOA, and, as a result, a portion of the PFAS will accumulate in biosolids generated during the treatment process.[56]

Controlling PFAS at the source is essential. CWA permitting authorities and industrial pretreatment programs must be utilized to require industrial dischargers to remove PFAS before releasing effluent into the environment or sending it to WWTPs.[57] The data collected in this monitoring project and discussed below provide strong evidence of the immediate need for EPA, states, and tribes to take those actions. The data also highlight the urgent need to direct federal infrastructure funding to municipal wastewater treatment systems in areas with multiple indicators of environmental and health burdens on disproportionately impacted communities, to support treatment upgrades and safe biosolids management that protect human health and the environment.

Table 4 | PFAS Types Detected at One or More Sites

	Analyte	Site Type
1	PFOS	WWTP and Biosolids
2	PFHxA	WWTP and Biosolids
3	PFHpS	Biosolids Site
4	PFOA	WWTP and Biosolids
5	PFHxS	WWTP and Biosolids
6	PFBS	WWTP and Biosolids
7	PFPeA	WWTP and Biosolids
8	PFHpA	WWTP and Biosolids
9	PFBA	WWTP and Biosolids
10	PFNA	WWTP and Biosolids
11	PFDA	WWTP and Biosolids
12	PFPeS	WWTP and Biosolids
13	6:2 FTS	WWTP
14	FOSA	WWTP and Biosolids
15	PFUnA	WWTP
16	HFPO-DA (Gen-X)	WWTP and Biosolids
17	PFMPA	WWTP
18	PFDoA	WWTP
19	8:2 FTS	WWTP
20	NMeFOSAA	WWTP
21	NEtFOSAA	WWTP
22	PFTeA	WWTP
23	PFMBA	WWTP

Figure 1 | Phase II PFAS Sampling Sites
Figure 2 | Phase I Sampling Sites



Method Evaluation

SiREM PFASsive™ samplers provide an effective method for conducting fresh surface water PFAS sampling that produce scientifically valid data in locations that are impacted by discharges from WWTPs and biosolids land application fields. With proper training provided by the SiREM PFASsive™ manufacturer, the devices were successfully deployed and retrieved by Waterkeeper groups in a wide variety of locations across the U.S.

SiREM PFASsive™ devices produced water samples that were analyzed by Eurofins Sacramento using the current approved EPA Method 1633 without any limitations attributable to the passive sampling device. A comparative analysis of the data demonstrated that SiREM PFASsive™ samplers produced reliable, consistent water quality data that was comparable between all sites despite the geographic, geomorphic, and hydrologic differences in watersheds.

The SiREM PFASsive™ passive sampling methodology captured time-integrated measurements of PFAS levels over periods of at least 20 days. Such measurements provide a more accurate representation of PFAS contamination and risk than traditional grab sample methods, which reflect PFAS concentrations that represent the entire mass of PFAS present at a single point in time and may result in an overestimation of the bioavailable PFAS exposure to human and ecological receptors. By collecting PFAS data over a longer period, understanding of PFAS migration, bioavailability, and impacts is enhanced, while also shedding light on the effectiveness of WWTP processes and land application methods in controlling or contributing to PFAS release into surface waters. The time-integrated measurements of PFAS concentrations over periods of at least 14 days is more practical and cost-effective than the alternative of collecting multiple samples on a daily or even weekly or monthly basis. This would require additional time and expenditures to collect multiple samples in the field, analyze those samples in a laboratory, and analyze multiple results for a single location.

The equilibrium concentrations generated through the use of SiREM PFASsive™ samplers provide a more accurate representation of PFAS contamination present in the sampled surface waters, and are more reflective of bioavailability, toxicity, and risk, than traditional single-day grab sample methods that may capture higher or lower values depending on the time of collection. Because PFAS are persistent, bioaccumulative, and toxic, it is critical to understand their migration pathways and bioavailability for proper delineation and risk characterization. Passive sampling in surface water is an accepted approach to assess bioavailability and risk.[58] The SiREM PFASsive™ passive sampler "is a diffusion-based equilibrium passive sampler that was developed and validated for relevant PFAS (EPA 537, EPA 1633) in porewater and surface water."[59] After retrieving the SiREM PFASsive™ device, the water collected in the sampler is treated like any other water sample allowing the PFAS to be concentrated and measured using EPA analysis methods "without the additional extraction steps required for sorbents" and the "results are presented as concentrations in nanograms per liter (ng/L)."[60] A reverse tracer in the devices also "allows the extent of equilibrium to be determined during deployment and used to estimate the freely dissolved equilibrium concentration in the environment. The freely dissolved equilibrium concentration has been shown to relate better to bioavailability, toxicity, and risk assessment models than concentrations measured from conventional grab samples."[61]

ELEVATED DOWNSTREAM WWTP SITE RESULTS as shown in Table 5 *(p. 23)*:

PFOA DETECTION
- 44 ppt Rouge River, MI
- 28 ppt Pocotaligo River, SC
- 13 ppt Santa Ana River, CA
- 10 ppt Haw River, NC

PFPeA DETECTION
- 43 ppt Santa Ana River, CA
- 38 ppt Pocotaligo River, SC
- 36 ppt Haw River, NC
- 22 ppt Monocacy River, MD
- 20 ppt Los Angeles River, CA
- 18 ppt Root River, WI

PFHxA DETECTION
- 49 ppt Pocotaligo River, SC
- 27 ppt Santa Ana River, CA
- 27 ppt Haw River, NC
- 20 ppt Los Angeles River, CA

PFOS DETECTION
- 30 ppt Pocotaligo River, SC
- 23 ppt Haw River, NC
- 13 ppt Cape Fear River, NC
- 12 ppt Santa Ana River, CA
- 12 ppt Hunting Bayou, TX
- 11 ppt East Canal, FL

Table 5 | Elevated Sample Values Downstream from WWTPs (ppt)

State	Waterkeeper/ Waterbody	Wastewater Treatment Plant		PFAS Analyte (ppt)																		
				PFOA	PFHxA	PFBS	PFPeA	PFHpA	PFHxS	PFOS	PFBA	PFNA	PFDA	PFPeS	FOSA	PFUnA	PFDoA	6:2 FTS	PFMPA	PFTeA	NMeFOSAA	PFMBA
AL	**Cahaba Riverkeeper** Cahaba River	Cahaba River WRF		4.9	6.4	6.4	10.0	1.9	1.5													
	Coosa Riverkeeper Big Wills Creek	Rainbow City WWTP		2.2					0.6		1.9				1.6							
CA	**Inland Empire Waterkeeper** Santa Ana River	Riverside RWQCP	Nov.		27.0		43.0															
			Aug. ⮟	13.0	20.0	21.0	24.0	3.6		12.0		2.1										6.1
	LA Waterkeeper Los Angeles River	LA-Glendale WRP			20.0		20.0	3.3			9.8		2.1									
CT	**Long Island Soundkeeper** Naugatuck River	Waterbury WPCF			8.9	3.1	8.1	2.6	1.7	8.3	4.8											
FL	**Tampa Bay Waterkeeper** East Canal	Plant City WRF	⮟	7.1	6.3	6.0	9.9	3.7	3.9	11.0	9.0	1.3		0.71								
GA	**Chattahoochee Riverkeeper** Chattahoochee River	Clayton, Sutton, West Area	◆	2.8	4.6	4.3	6.1	1.5			2.1						1.2		2.1	4.1		
MD	**Potomac Riverkeeper** Monocacy River	City of Frederick WWTP		6.8	13.0	5.0	22.0	2.5	2.5		4.4				0.62							
MI	**Detroit Riverkeeper** Rouge River	Great Lakes Water Authority Water Resource Recovery Facility (GLWA WRRF)		44.0	9.2				16.0	3.1			5.0									
MS	**Pearl Riverkeeper** Pearl River	Jackson POTW, Savanna Street / West Rankin Utility Authority WWTF	⮟	2.9	4.4	3.0		1.3	1.3	3.5	3.6	0.71										
NC	**Cape Fear Riverkeeper** Cape Fear River	Cross Creek WRF		8.3	6.7	4.7	8.6	3.7	5.3	13.0	5.4			0.94								
	Haw Riverkeeper Haw River	Graham WWTP		10.0	27.0	17.0	36.0	8.8	4.5	23.0	9.2	2.2	2.6			0.87	0.59	1.1	0.88			
NJ	**Hackensack Riverkeeper** Ramapo River	Western Ramapo Advanced WWTP / Suffern (V) STP	Nov.	6.7	10.0	2.5			3.5	4.7												
OR	**Tualatin Riverkeepers** Tualatin River	Rock Creek WRRF		3.3	7.1	3.5	4.4	1.7	0.73	2.5	6.2	0.59										
RI	**Narragansett Bay Riverkeeper** Pawtuxet River	Cranston WPCF	©				5.7	4.9	2.3			2.1										
SC	**Black-Sampit Riverkeeper** Pocotaligo River	Sumter Pocotaligo River WWTP		28.0	49.0	5.5	38.0	21.0		30.0	12.0	2.3	2.1		1.7	0.79		22.0			1.1	
TX	**Bayou City Waterkeeper** Hunting Bayou	Homestead WWTP		4.0	11.0	11.0	9.3			12.0		1.3	0.64									
VA	**James Riverkeeper** Appomattox River	South Central Wastewater Authority WWTF		2.6		2.3	4.4			2.6		0.75										
WA	**Spokane Riverkeeper** Spokane River	Spokane Riverside Park WRF		1.1	2.0				0.8	2.1												
WI	**Milwaukee Riverkeeper** Root River	City of Waukesha WWTP	©	8.0	7.6	4.8	18.0	1.9	2.1	5.0	6.5	1.3	0.83									
WV	**Upper Potomac Riverkeeper** Opequon Creek	Berkeley County PSSD – Inwood WWTP		4.1	7.2	9.3	9.3															
	West Virginia Headwaters Waterkeeper Ohio River	Parkersburg Utility Board				1.6																

Includes all downstream sample results where the downstream value exceeded the upstream value except where as noted with an ⮟ did not have upstream samples.
© **Combined:** The result represents the highest concentration in either the primary or duplicate sample.
◆ City of Atlanta's R.M Clayton WRC, Cobb County's R.L. Sutton WRF, and West Area Water Quality Control Facility (WQCF)

Overview of Results for WWTPs and Biosolids Land Application Fields

The sampling data collected through this project confirmed, consistent with the results of our Phase I sampling, that U.S. surface waters are widely contaminated by many different types of PFAS. Although we sampled fewer waterways in this project than in the previous monitoring project, we found that one or more PFAS were detected at all surface water sampling sites tested both upstream and downstream from WWTPs and biosolids land application fields in 19 states, with the exception of a single site downstream from a biosolids land application field in Wisconsin. See Appendix A.

The sampling results also indicated the widespread presence of multiple types of PFAS in U.S. surface waters. Out of 40 types of PFAS detected by EPA Method 1633, 23 types of PFAS were detected in upstream or downstream surface water sampling sites.

PFAS Surface Water Contamination from WWTPs and Biosolids Land Application Fields

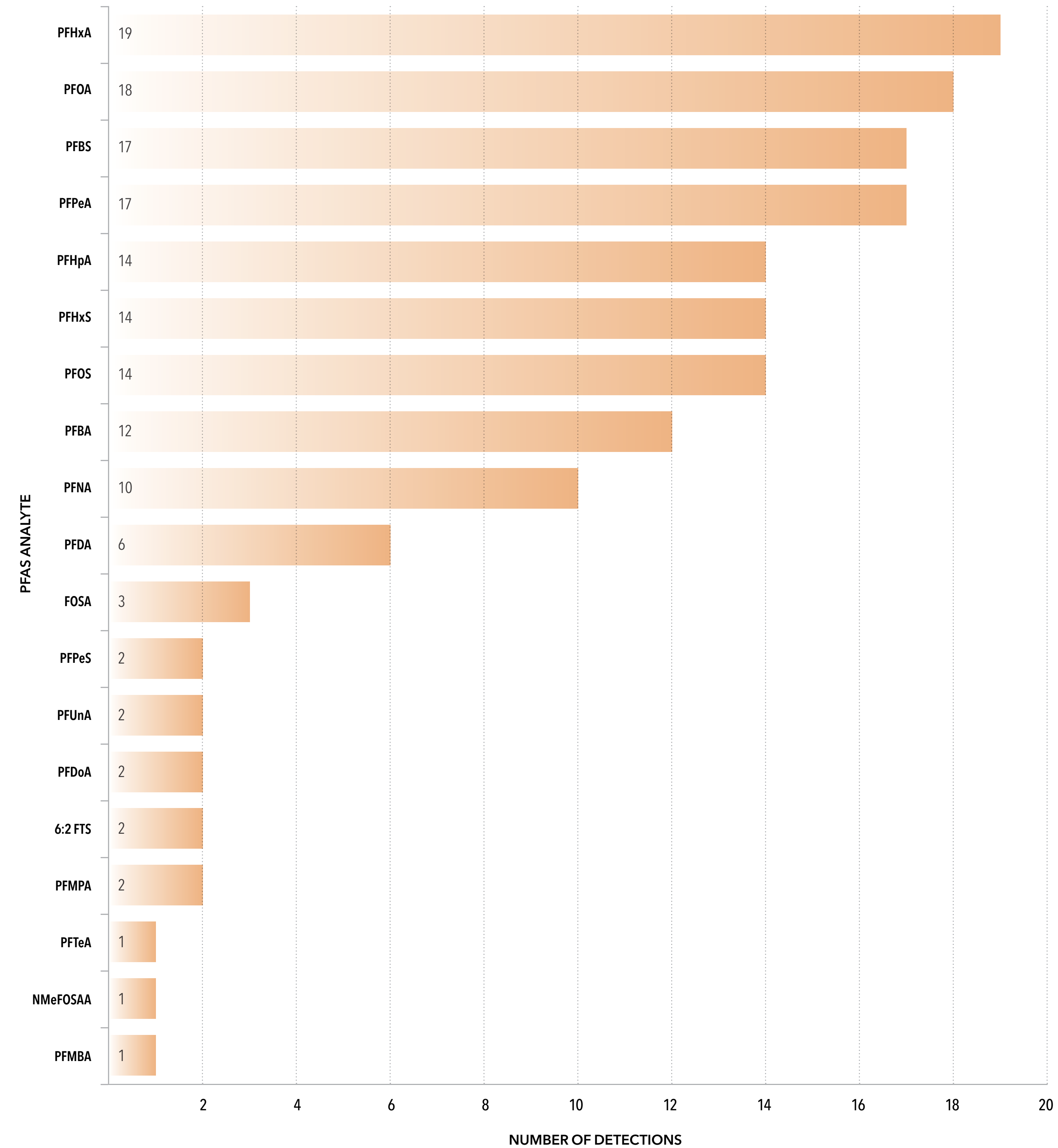
The sampling data collected in the project clearly demonstrate that discharges of PFAS from multiple WWTPs and biosolids land application fields that we evaluated are contributing multiple types of PFAS to U.S. surface waters. By comparing upstream and downstream results, we determined that elevated concentrations of multiple types of PFAS were detected at 21 of 22 downstream WWTP sampling sites[62] and at 8 of the 10 downstream biosolids land application sampling sites. *See Table 5[63] (p. 23) and Table 6 (below).* Pearl River biosolids site sampling results reported and analyzed below include any PFAS contributed by Jackson POTW's biosolids land application fields and the Trahon and Big Creek WWTF to Big Creek above its confluence with the Pearl River.

Table 6 | Elevated Sample Values Downstream from Biosolids Land Application Fields[64]

State	Waterbody		PFAS Analyte (ppt)													
			PFBA	PFBS	PFPeA	PFHxA	PFHpA	PFOA	PFNA	PFOS	PFHxS	PFDA	FOSA	PFPeS	PFHpS	HFPO-DA (GenX)
AL	Cane Creek	©	11.00	2.70	11.00	4.20	1.70	4.10	0.68	5.80						
MD	Monocacy River		6.20	3.90		4.90	2.20		0.77							
MS	Pearl River	◆			13.00					3.60		0.73				
NC	Haw Creek		3.90	5.30					1.90			0.81		2.20	1.30	
NC	South River	©	6.70	5.50	4.80	3.20	2.80	5.80	1.40	7.50	2.40		0.86			0.94
VA	Old Town Creek	▾	1.30	1.30	1.70	1.70	0.81	3.90		3.10	1.50					
WA	Dragoon Creek		3.10	5.80	12.00	7.40	1.50	1.50			0.71		0.88			
WV	Back Creek	©	2.50	2.50	1.40	3.10	1.00									

Includes all downstream sample results where the downstream value exceeded the upstream value except where as noted with an ▾ did not have upstream samples.
© **Combined:** The result represents the highest concentration in either the primary or duplicate sample.
◆ Jackson POTW, Trahon, and Big Creek WWTF also discharges to the sampled waterway through Big Creek and could have contributed PFAS to the downstream sample results.

Figure 3 | Number of Elevated Downstream PFAS Detections at WWTP Sites, by Analyte



Wastewater Treatment Plants

Out of 40 types of PFAS detected by EPA Method 1633, 19 types of PFAS at elevated levels were detected downstream from WWTPs. The most frequently detected PFAS at elevated levels downstream from wastewater treatment plants include PFHxA (19 detections), PFOA (18 detections), PFBS and PFPeA (17 detections), PFHpA, PFHxS, and PFOS (14 detections), PFBA (12 detections), and PFNA (10 detections). *See Figure 3 (p. 25).*

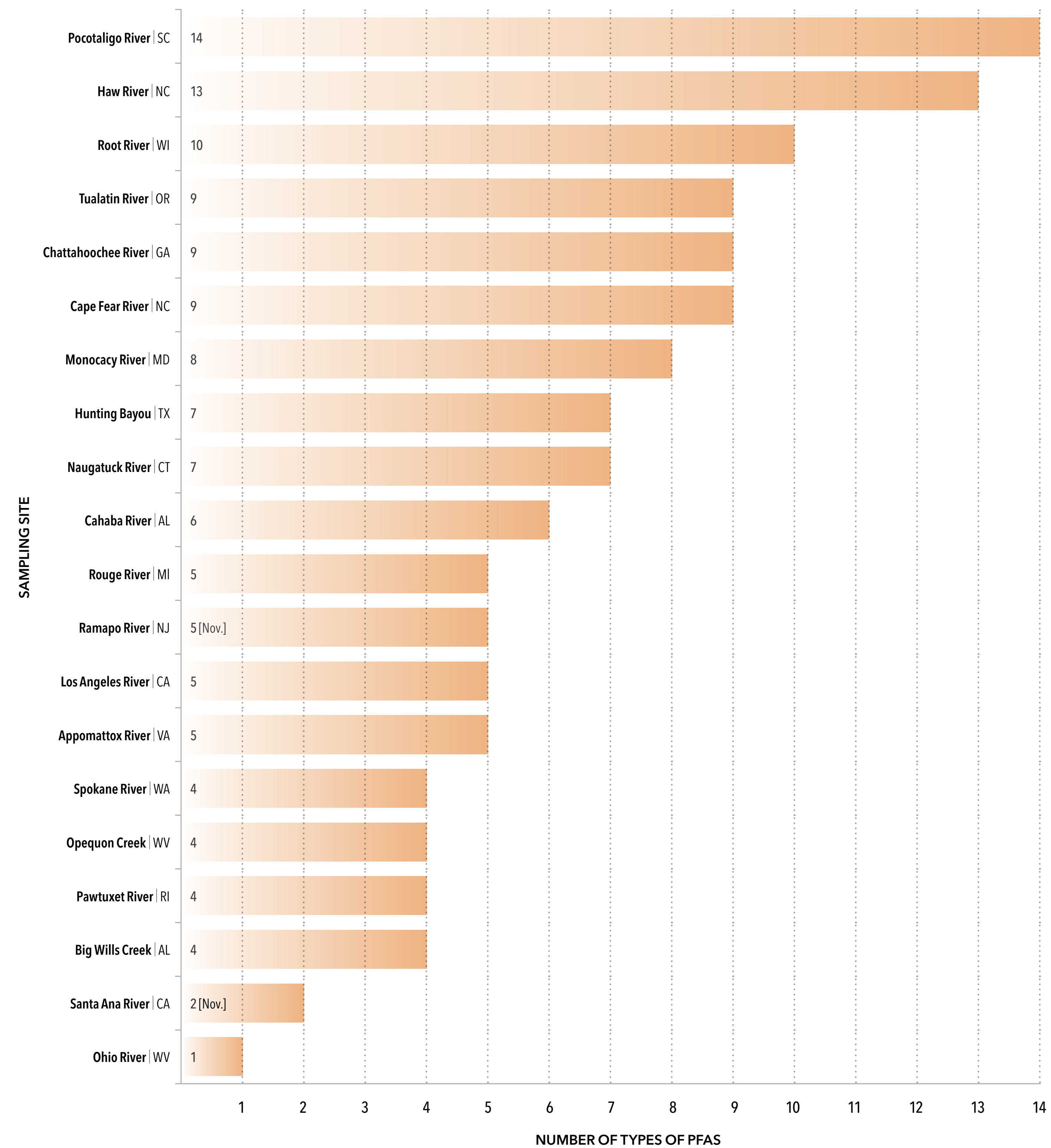
The highest elevated concentration of PFAS downstream from a WWTP was PFHxA at 49 ppt in the Pocotaligo River below the Sumter Pocotaligo River WWTP in South Carolina. PFHxA was detected in 19 samples downstream from WWTPs and the mean concentration of all values combined was 13.02 ppt. PFOA was also detected in 18 samples taken downstream from WWTPs, with a mean concentration of 8.88 ppt for all sites and the highest elevated concentration, 44 ppt, was found in the Rouge River below the GLWA WRRF in Michigan. *See Table 7 (below).*

Multiple types of PFAS were also frequently detected, often at high concentrations, at elevated levels at a single sampling site downstream from each WWTP, presenting unacceptable, cumulative risks to communities with multiple EJScreen Indexes that exceed the 80th percentile. For example, 14 types of PFAS were detected at the sampling site in the Haw River downstream from a Graham WWTP outfall in North Carolina, 13 types of PFAS were detected at the sampling site in the Pocotaligo River downstream from a Sumter Pocotaligo River WWTP outfall in South Carolina, and 10 types of PFAS were detected at the sampling site in the Root River downstream from a Waukesha WWTP outfall in Wisconsin. *See Figure 4 (p. 27).*

Table 7 | PFAS Concentrations and Watersheds with Highest Detection for Each Analyte Downstream from WWTPs
Maximum, Minimum, and Mean

Analyte	Watershed with Highest Elevated Detection	Elevated Downstream Detection (ppt)			
		Number of Detections	Mean	Minimum	Maximum
PFHxA	Pocotaligo River	19	13.02	2	49
PFOA	Rouge River	18	8.88	1.1	44
PFPeA	Santa Ana River	17	16.28	4.4	43
PFOS	Pocotaligo River	14	9.49	2.1	30
6:2 FTS	Pocotaligo River	2	11.55	1.1	22
PFBS	Santa Ana River	17	6.53	1.6	21
PFHpA	Pocotaligo River	14	4.46	1.3	21
PFHxS	Rouge River	14	0.64	0.64	16
PFBA	Pocotaligo River	12	6.24	1.9	12
PFMBA	Santa Ana River	1	6.1	6.1	6.1
PFDA	Rouge River	6	2.21	0.64	5
PFTeA	Chattahoochee River	1	4.1	4.1	4.1
PFNA	Pocotaligo River	10	1.47	0.59	2.3
PFMPA	Chattahoochee River	2	1.49	0.88	2.1
FOSA	Pocotaligo River	3	1.31	0.62	1.7
PFDoA	Chattahoochee River	2	0.9	0.59	1.2
PFPeS	Cape Fear River	2	0.83	0.71	0.94
NMeFOSAA	Pocotaligo River	1	1.1	1.1	1.1
PFUnA	Haw River	2	0.83	0.79	0.87

Figure 4 | Number of Different PFAS Types Elevated Downstream from WWTPs
Comparing Upstream/Downstream Sample Results



Biosolids Land Application Fields

Out of 40 types of PFAS detected by EPA Method 1633, in comparison to PFAS levels detected at upstream sampling sites, the sampling detected 14 types of PFAS at elevated levels downstream from biosolids land application sites. The most frequently detected PFAS at elevated levels downstream from biosolids land application sites include PFBA and PFBS (7 detections), PFPeA, PFHxA, and PFHpA (6 detections), and PFOA, PFNA, and PFOS (4 detections). *See Figure 5 (below).*

PFPeA was detected at elevated levels at six of the 10 biosolids land application sites, with a mean concentration of 7.32 ppt for all sites. PFBA was detected at elevated levels downstream from seven biosolids land application sites with a mean concentration of 4.96 ppt for all sites and the highest elevated concentration, 11 ppt, was found in Cane Creek below the Beltona Mine Land Reclamation Site in Alabama. *See Figure 6 (below).*

Figure 5 | Number of Elevated Downstream PFAS Detections at Biosolid Sampling Sites by Analyte

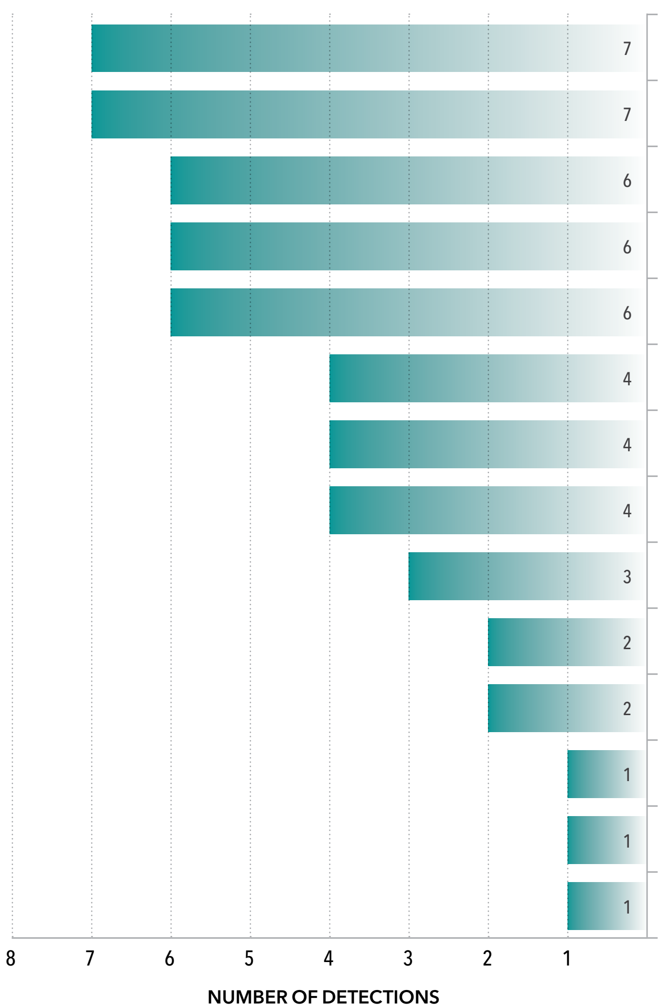
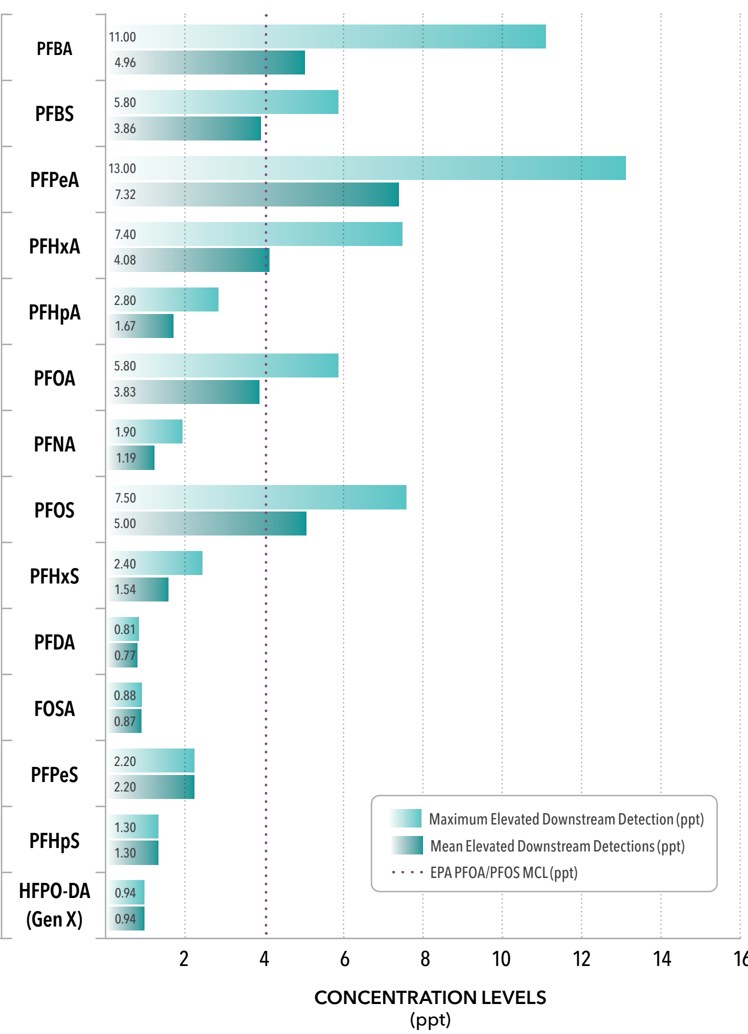


Figure 6 | Biosolids Application Fields Maximum and Mean Concentrations of Elevated PFAS Downstream from All Sites



Specific PFAS Types

As shown in Figure 7 [WWTP Sites] and Figure 8 [Biosolids Sites], PFPeA was responsible for the greatest increases in PFAS concentrations downstream from nine WWTPs and five biosolids land application fields. PFHxA was responsible for the greatest increases in PFAS concentrations downstream from five WWTPs. Notably, these types of PFAS are neither regulated by EPA nor included in the draft HHWQC.[65] These two compounds are also not regulated as hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)[66] or the SDWA.[67] As for the other PFAS responsible for the greatest increases at other WWTPs, EPA has only established MCLs for PFOA, PFOS, and PFHxS and a Hazard Index value for a mixture containing two or more of PFHxS, PFNA, HFPO-DA, and PFBS. EPA has also proposed draft HHWQC for PFOA, PFOS, and PFBS.[68]

Figure 7 | PFAS Analytes with Greatest Downstream Concentration Increase by Number of Watersheds
Upstream and Downstream Comparison at Wastewater Treatment Plants

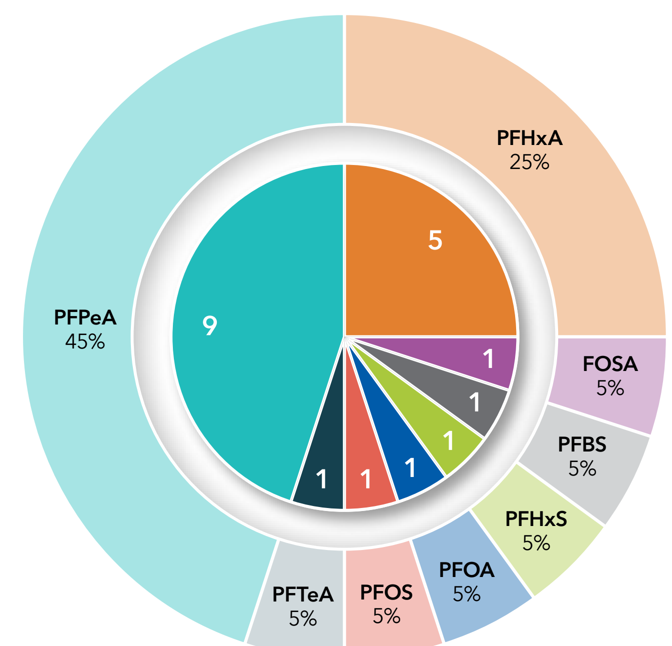


Figure 8 | PFAS Analytes with Greatest Downstream Increase in Concentration by Number of Watersheds
Upstream and Downstream Comparison at Biosolids Land Application Fields

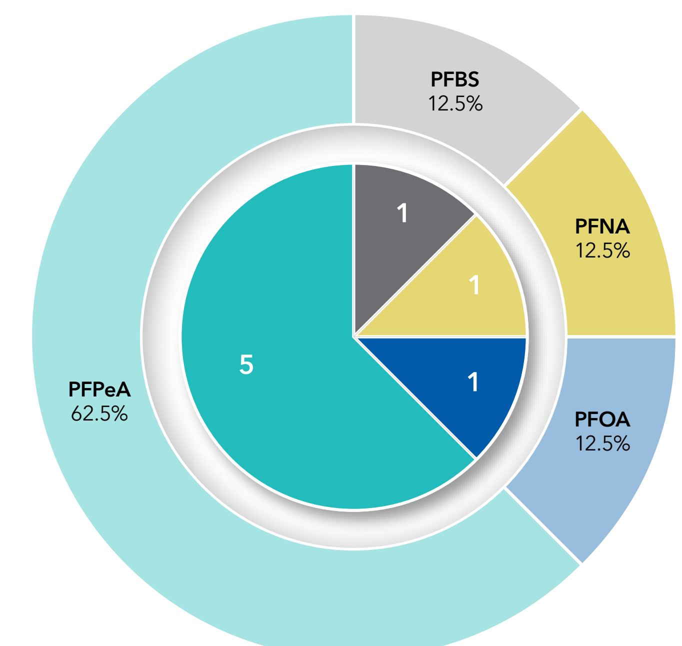


Table 8 | PFAS Analytes with Greatest Concentration Increase in Downstream WWTP Site Samples

State	Waterbody	Waterkeeper	PFAS Analyte with Greatest Increase	Amount of Increase (ppt)	Total # of PFAS Analytes Elevated
AL	Cahaba River	Cahaba Riverkeeper	PFPeA	2.7	6
	Big Wills Creek	Coosa Riverkeeper	FOSA	1.6	4
CA	Santa Ana River [Nov.]	Inland Empire Waterkeeper	PFPeA	31	2
	Los Angeles River	LA Waterkeeper	PFPeA	8	5
CT	Naugatuck River	Long Island Soundkeeper	PFHxA	1.8	7
FL	East Canal	Tampa Bay Waterkeeper	No Upstream Sample		
GA	Chattahoochee River	Chattahoochee Riverkeeper	PFTeA	4.1	9
MD	Monocacy River	Potomac Riverkeeper	PFPeA	17.8	8
MI	Rouge River	Detroit Riverkeeper	PFOA	40.2	5
MS	Pearl River	Pearl Riverkeeper	No Upstream Sample		
NC	Cape Fear River	Cape Fear Riverkeeper	PFOS	2	9
	Haw River	Haw Riverkeeper	PFPeA	22	14
NJ	Ramapo River [Nov.]	Hackensack Riverkeeper	PFHxS	3.5	5
OR	Tualatin River	Tualatin Riverkeepers	PFHxA	7.1	9
RI	Pawtuxet River ©	Narragansett Bay Riverkeeper	PFPeA	0.2	4
SC	Pocotaligo River	Black-Sampit Riverkeeper	PFHxA	39.4	13
TX	Hunting Bayou	Bayou City Waterkeeper	PFHxA	4.2	7
VA	Appomattox River	James Riverkeeper	PFPeA	0.9	5
WA	Spokane River	Spokane Riverkeeper	PFHxA	1.46	4
WI	Root River ©	Milwaukee Riverkeeper	PFPeA	12.3	10
WV	Opequon Creek	Upper Potomac Riverkeeper	PFPeA	1.4	4
	Ohio River	West Virginia Headwaters Waterkeeper	PFBS	0.1	1

© **Combined:** The result represents the highest concentration in either the primary or duplicate sample.

As shown in Table 8 *(above)*, downstream from WWTPs:

CALIFORNIA
In Inland Empire Waterkeeper's watershed, PFPeA increased by 31 ppt in the Santa Ana River below the Riverside RWQCP's outfall in California.

NORTH CAROLINA
In Haw Riverkeeper's watershed, PFPeA increased by 22 ppt in the Haw River below the City of Graham WWTP's outfall in North Carolina.

SOUTH CAROLINA
In Black-Sampit Riverkeeper's watershed, PFHxA increased by 39.4 ppt in the Pocotaligo River below the Sumter Pocotaligo River Plant outfall in South Carolina.

Table 9 | PFAS Analytes with Greatest Concentration Increase in Downstream Biosolids Site Samples

State	Waterbody	Waterkeeper	PFAS Analyte with Greatest Increase	Amount of Increase (ppt)
AL	Cane Creek ©	Cahaba Riverkeeper and Black Warrior Riverkeeper	PFPeA	11
	Whippoorwill Creek	Coosa Riverkeeper	No Increase	
MD	Monocacy River	Potomac Riverkeeper	PFNA	0.77
MS	Pearl River	Pearl Riverkeeper	PFPeA	1
NC	South River ©	Cape Fear Riverkeeper	PFPeA	4.8
	Haw Creek	Haw Riverkeeper	PFBS	5.3
VA	Old Town Creek ⌄	James Riverkeeper	PFOA	3.9
WA	Dragoon Creek	Spokane Riverkeeper	PFPeA	12
WI	Spring Creek	Milwaukee Riverkeeper	No Increase	
WV	Back Creek ©	Upper Potomac Riverkeeper	PFPeA	1.4

© **Combined:** The result represents the highest concentration in either the primary or duplicate sample.
⌄ James Riverkeeper location has no upstream site.

As shown in Table 9 *(left)*, downstream from biosolids land application fields:

ALABAMA
In Black Warrior Riverkeeper's watershed, PFPeA increased by 11 ppt in the Cane Creek below the Jefferson County Commission WWTPs' biosolids application site in Alabama.

WASHINGTON
In Spokane Riverkeeper's watershed, PFPeA increased by 12 ppt in the Dragoon Creek below the Spokane Riverside Park WRF's biosolids application fields in Washington.

Total PFAS Concentrations

The data collected in this project demonstrates that it is imperative for PFAS to be regulated as a class, as opposed to solely as individual chemicals, in order to effectively control widespread exposure and address the risks posed by combined exposures to multiple PFAS chemicals in U.S. surface waters.[69] Regulating PFAS on a compound-by-compound basis has left thousands of PFAS chemicals completely unregulated. As our data demonstrate, multiple types of PFAS often co-occur at a single location and unregulated PFAS are often present at high concentrations. The presence of multiple types of PFAS heightens human exposure risk since PFAS mixtures may have additive and synergistic effects."[70] Moreover, the harmful effects of PFAS exposure may be "more related to total PFAS levels, rather than individual PFAS compounds."[71]

In this project, the most frequently detected PFAS in upstream and downstream samples tended to co-occur at multiple locations leading to high overall exposure to total PFAS at those locations. For example, as shown in Figure 9 *(p. 32)*, PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, and PFOS were detected in 40 or more samples near WWTPs. In 32 samples, the sampling detected PFOS, PFHxA, PFOA, PFHxS, PFBS, PFPeA, PFHpA, PFBA, and PFNA (often as well as other PFAS) at that single location. See Appendix A.

Figure 9 | PFAS Types Detected Upstream and Downstream from WWTPs

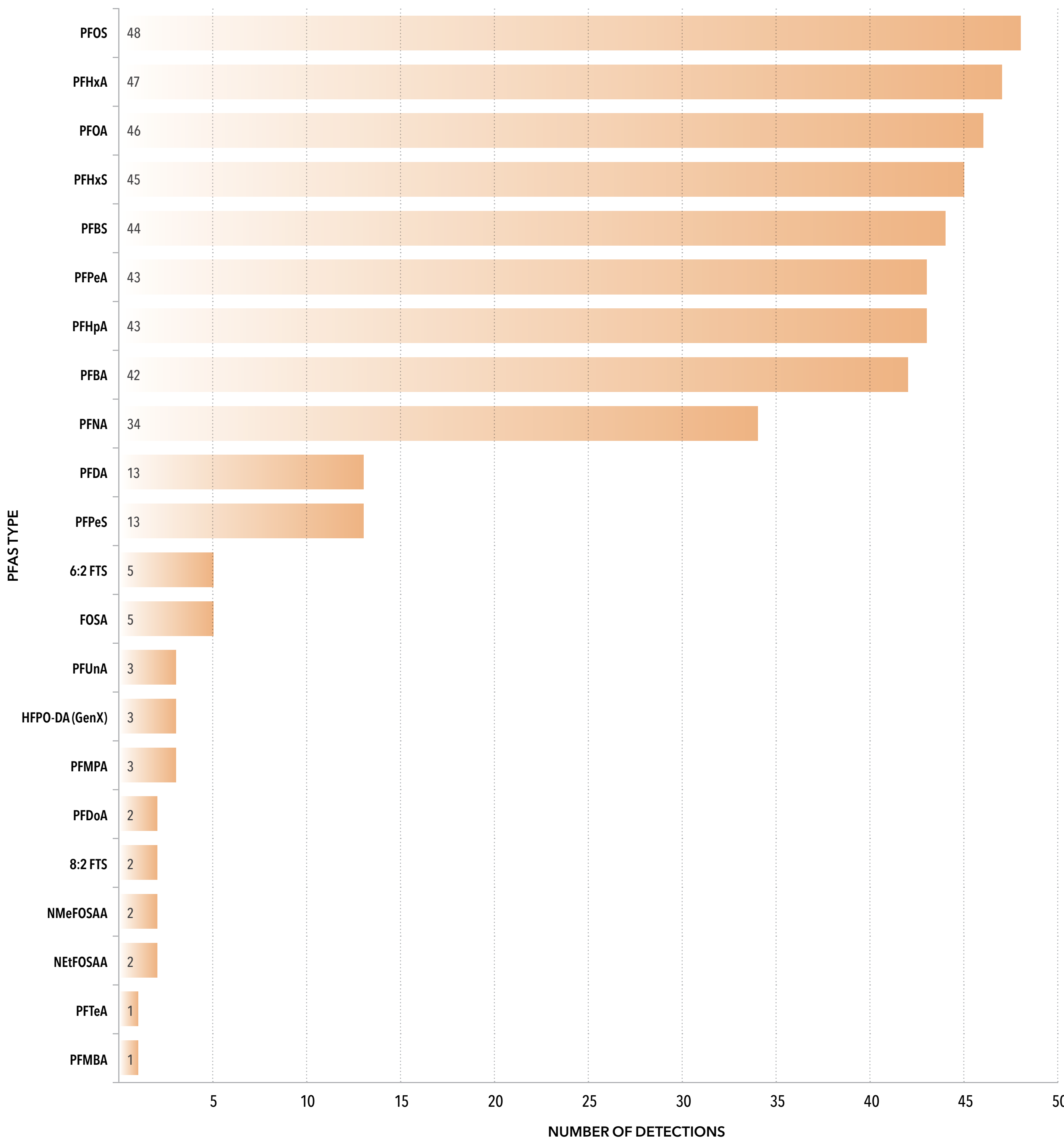
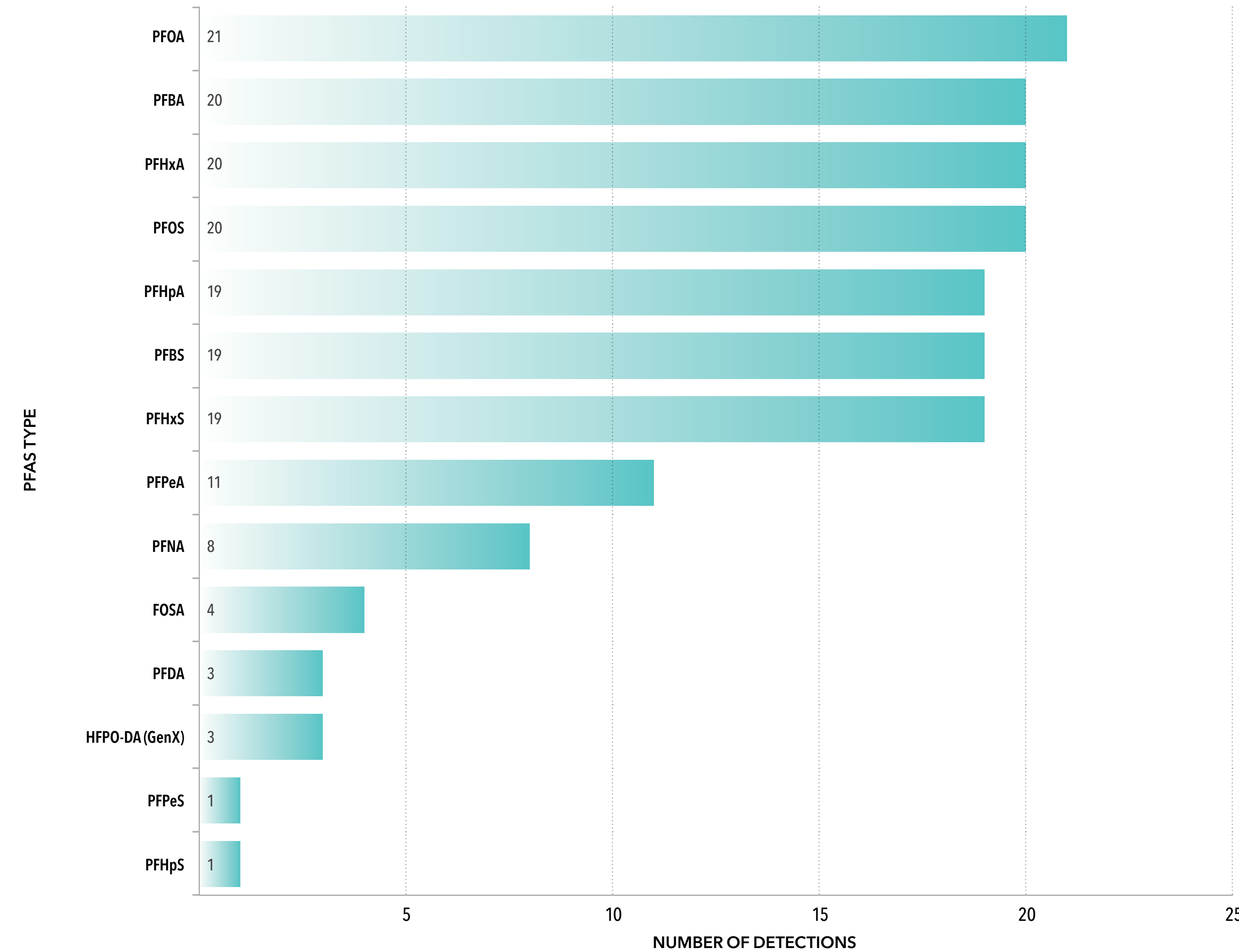


Figure 10 | PFAS Types Detected Upstream and Downstream from Biosolids Land Application Fields



Similarly, near biosolids land application sites, as shown in Figure 10 *(above)*, the most frequently detected PFAS include PFOA, PFBA, PFHxA, PFOS, PFHpA, PFBS, and PFHxS, occurring in 19 or more samples. In 16 samples, the sampling detected PFOA, PFBA, PFHxA, PFOS, PFHpA, PFBS, and PFHxS (often as well as other PFAS) at that single location. See Appendix A.

By contrast, PFUnA, PFDoA, PFTeA, 8:2 FTS, NMeFOSAA, NEtFOSAA, HFPO-DA (Gen-X), PFMBA, and PFMPA were detected at 3 or fewer sampling sites near WWTPs, and PFDA, PFPeS, PFHpS, and HFPO-DA (Gen-X) were detected in 3 or fewer samples near biosolids land application sites.

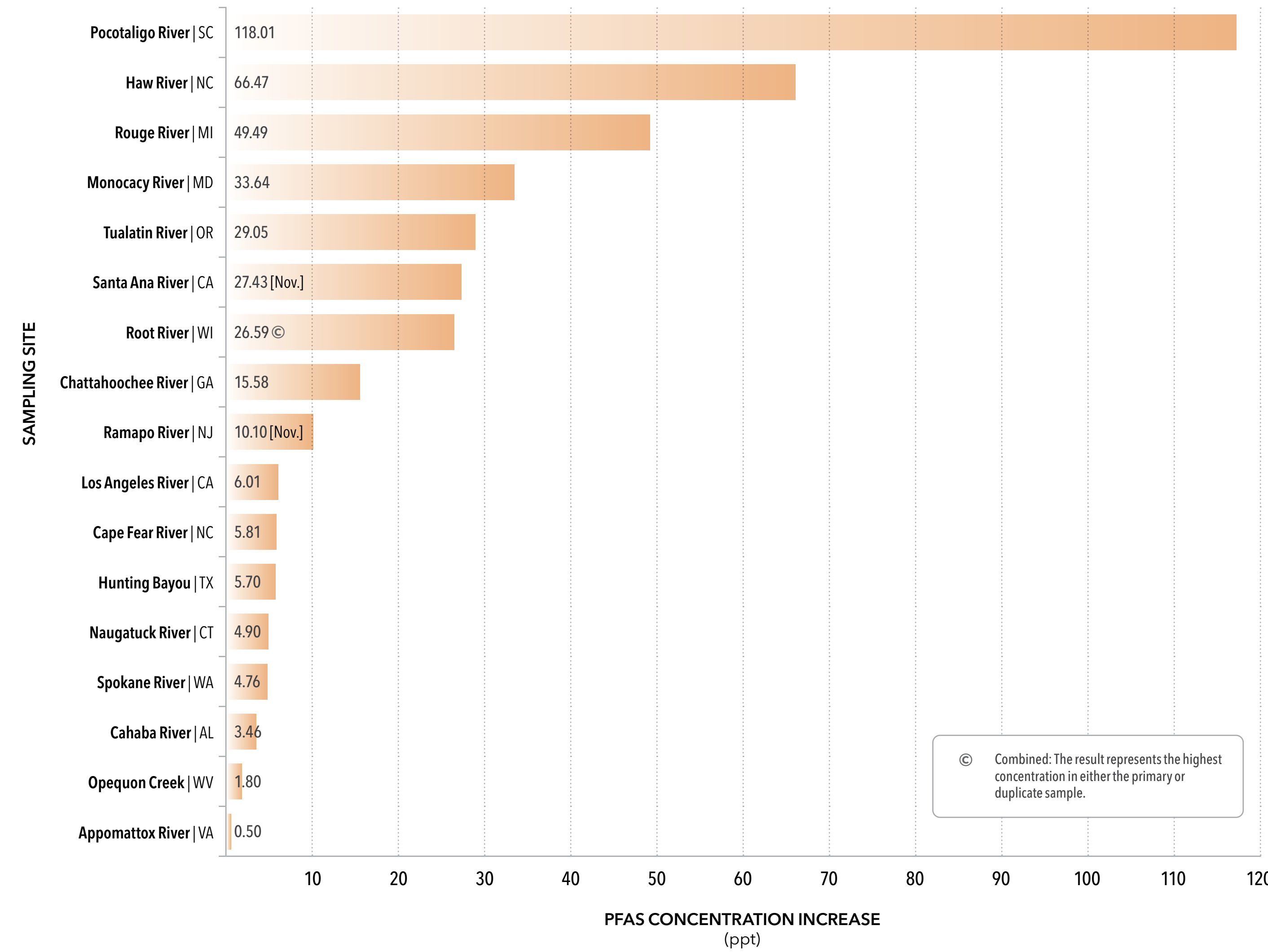
Additionally, as shown in Tables 10 *(p. 34)* and Table 11 *(p. 36)*, as a result of the presence of multiple PFAS chemicals, the total PFAS concentration downstream from 17 WWTPs and six biosolids land application sites increased, sometimes very significantly, above total upstream PFAS concentrations. Significant total PFAS concentrations were also detected at the downstream sites for two WWTPs and one biosolids land application field that did not have upstream sampling sites.

Table 10 | Total PFAS Concentrations Upstream and Downstream from WWTPs

State	Waterbody	Waterkeeper	Total PFAS (ppt)		Increase or Decrease (ppt)	Percent Increase or Decrease
			Upstream	Downstream		
AL	Cahaba River	Cahaba Riverkeeper	38.07	41.53	3.46	9.09%
	Big Wills Creek	Coosa Riverkeeper	15.04	12.71	-2.33	-15.49%
CA	Santa Ana River [Nov.]	Inland Empire Waterkeeper	89.70	117.13	27.43	30.58%
	Los Angeles River	LA Waterkeeper	69.79	75.80	6.01	8.61%
CT	Naugatuck River	Long Island Soundkeeper	41.60	46.50	4.90	11.78%
FL	East Canal	Tampa Bay Waterkeeper	No Sample	58.91		
GA	Chattahoochee River	Chattahoochee Riverkeeper	17.52	33.10	15.58	88.93%
MD	Monocacy River	Potomac Riverkeeper	26.28	59.92	33.64	128.01%
MI	Rouge River	Detroit Riverkeeper	33.71	83.20	49.49	146.81%
MS	Pearl River	Pearl Riverkeeper	No Sample	20.71		
NC	Haw River	Haw Riverkeeper	78.07	144.54	66.47	85.14%
	Cape Fear River	Cape Fear Riverkeeper	51.93	57.74	5.81	11.19%
NY/NJ	Ramapo River [Nov.]	Hackensack Riverkeeper	22.10	32.20	10.10	45.70%
OR	Tualatin River	Tualatin Riverkeepers	0.97	30.02	29.05	2994.85%
RI	Pawtuxet River ©	Narragansett Bay Riverkeeper	39.40	39.00	-0.40	-1.02%
SC	Pocotaligo River	Black-Sampit Riverkeeper	110.38	228.39	118.01	106.91%
TX	Hunting Bayou	Bayou City Waterkeeper	57.77	63.47	5.70	9.87%
VA	Appomattox River	James Riverkeeper	21.11	21.61	0.50	2.37%
WA	Spokane River	Spokane Riverkeeper	1.24	6.00	4.76	383.87%
WI	Root River ©	Milwaukee Riverkeeper	29.44	56.03	26.59	90.32%
WV	Opequon Creek	Upper Potomac Riverkeeper	45.10	46.90	1.80	3.99%
	Ohio River	West Virginia Headwaters Waterkeeper	21.95	18.86	-3.09	-14.08%

© **Combined:** The result represents the highest concentration in either the primary or duplicate sample.

Figure 11 | Amount of Total PFAS Increase Downstream from WWTPs



As shown in Table 10 *(p. 34)* and Figure 11 *(above)*, at WWTPs:

MICHIGAN

The Rouge River's total PFAS concentration increased from 33.71 ppt upstream to 83.20 ppt downstream from the GLWA WRRF – an increase of 49.49 ppt or 146.81%.

OREGON

The Tualatin River's total PFAS concentration increased from 0.97 ppt upstream to 30.02 ppt immediately downstream from the Rock Creek WRRF – an increase of 29.05 ppt or 2,994.85%.

SOUTH CAROLINA

The Pocotaligo River's total PFAS concentration increased from 110.38 ppt upstream to 228.39 ppt downstream from the Sumter Pocotalio River Plant—an increase of 118.01 ppt or 106.91%.

NORTH CAROLINA

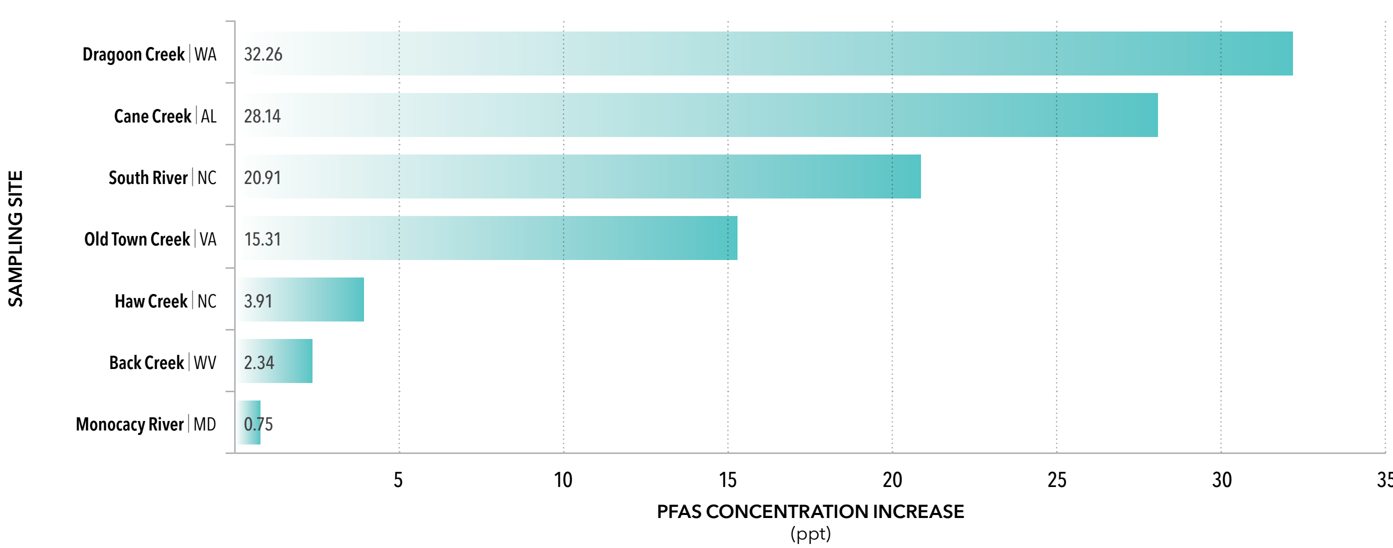
The Haw River's total PFAS concentration increased from 78.07 ppt upstream to 144.54 ppt downstream from the Graham WWTP – an increase of 66.47 ppt or 85.14%.

Table 11 | Total PFAS Concentrations Upstream and Downstream from Biosolids Land Application Fields

State	Waterbody		Waterkeeper	Total PFAS (ppt)		Increase or Decrease (ppt)	Percent Increase or Decrease
				Upstream	Downstream		
AL	Cane Creek	©	Cahaba Riverkeeper	15.04	43.18	28.14	187.10%
	Whippoorwill Creek		Coosa Riverkeeper	14.02	2.27	-11.75	-83.81%
MD	Monocacy River		Potomac Riverkeeper	27.27	28.02	0.75	2.75%
MS	Pearl River		Pearl Riverkeeper	32.67	30.78	-1.89	-5.79%
NC	South River	©	Cape Fear Riverkeeper	20.99	41.90	20.91	99.62%
	Haw Creek		Haw Riverkeeper	102.60	106.51	3.91	3.81%
VA	Old Town Creek		James Riverkeeper	No Sample	15.31		
WA	Dragoon Creek		Spokane Riverkeeper	0.63	32.89	32.26	5120.63%
WI	Spring Creek		Milwaukee Riverkeeper	1.10	0	-1.10	-100.00%
WV	Back Creek	©	Upper Potomac Riverkeeper	15.26	17.60	2.34	15.33%

© **Combined:** The result represents the highest concentration in either the primary or duplicate sample.

Figure 12 | Amount of Total PFAS Increase Downstream from Biosolids Land Application Fields



As shown in Table 11 and Figure 12 *(above)*, downstream from biosolids land application sites:

ALABAMA

Cane Creek's total PFAS concentration increased from 15.04 ppt upstream to 43.18 ppt downstream from Jefferson County Commission WWTPs' biosolids application site – an increase of 28.14 ppt or 187.10%.

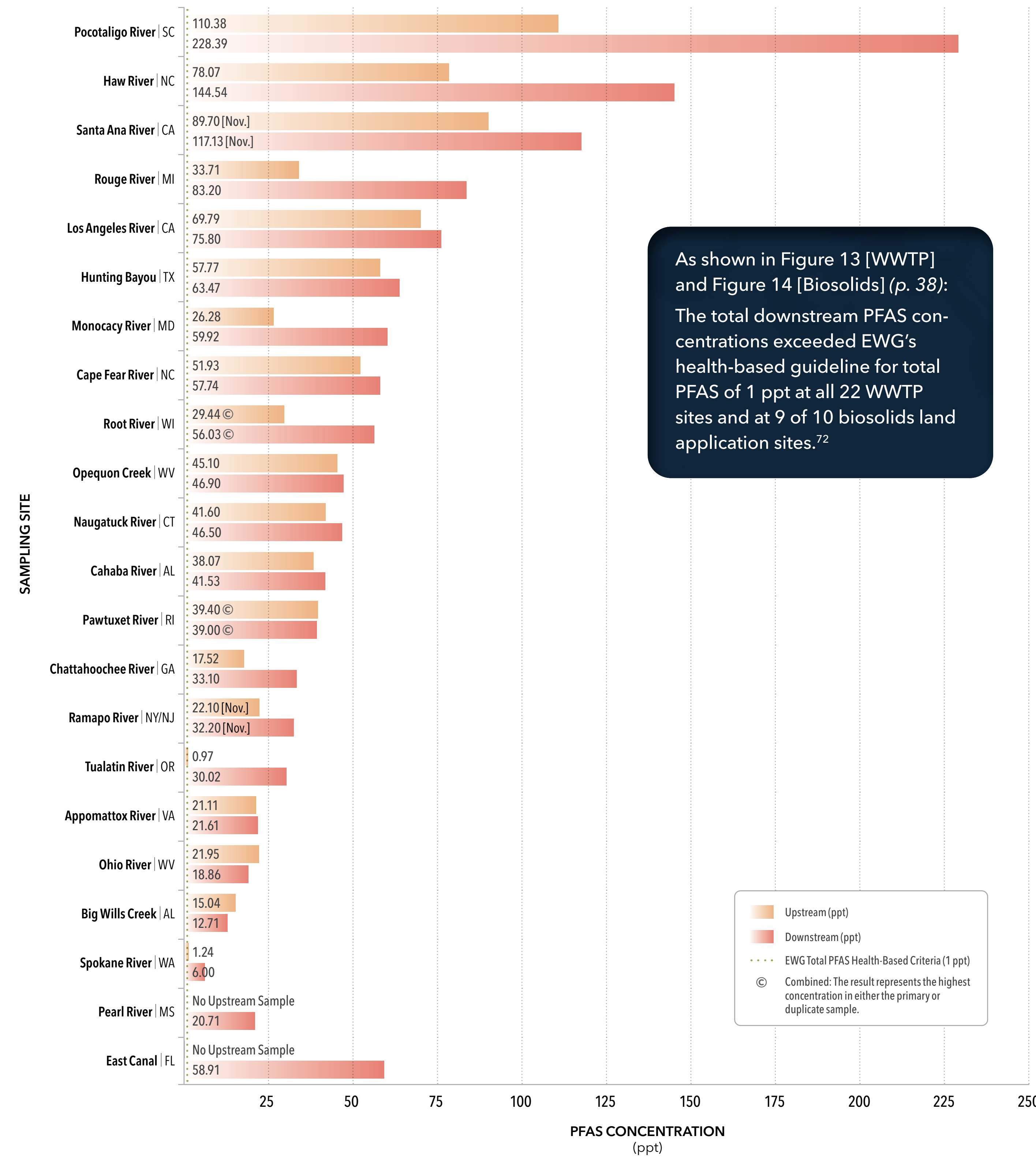
NORTH CAROLINA

South River's total PFAS concentration increased from 20.99 ppt upstream to 41.9 ppt downstream from Fayetteville Cross Creek WRF's biosolids application fields – an increase of 20.91 ppt or 99.62%.

WASHINGTON

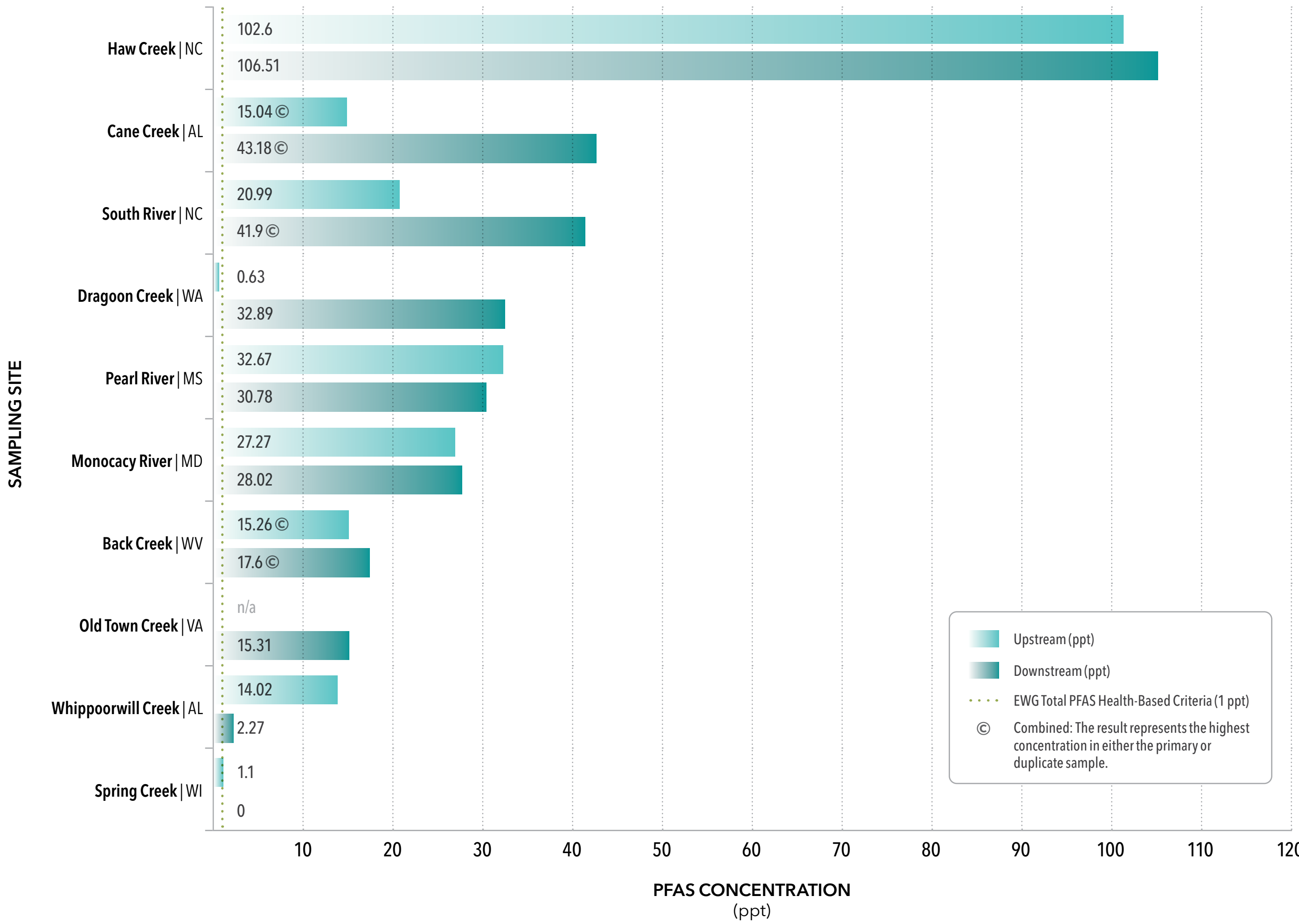
Dragoon Creek's total PFAS concentration increased from 0.63 ppt upstream to 32.89 ppt immediately downstream from Spokane Riverside Park WRF's biosolids land application fields – an increase of 32.26 ppt or 5,120.63%.

Figure 13 | Total PFAS Concentrations Upstream and Downstream from WWTPs



As shown in Figure 13 [WWTP] and Figure 14 [Biosolids] *(p. 38)*: The total downstream PFAS concentrations exceeded EWG's health-based guideline for total PFAS of 1 ppt at all 22 WWTP sites and at 9 of 10 biosolids land application sites.[72]

Figure 14 | Total PFAS Upstream and Downstream from Biosolids Application Sites



PFAS Criteria

While there is no safe level of PFAS in drinking water, there are a limited number of state and/or federal health-based criteria applicable to water for some PFAS. EWG has developed health-based criteria applicable to water for most PFAS[73] that can also be utilized to evaluate the levels of PFAS we detected in this sampling project. *See Table 12 (p. 39).*

EPA has finalized MCLs under the federal SDWA[74] for only five PFAS—PFOA, PFOS, PFNA, PFHxS, and HFPO-DA (Gen-X)—and a Hazard Index for mixtures containing two or more of PFHxS, PFNA, HFPO-DA, and PFBS.[75] EPA has also published draft HHWQC under the Clean Water Act for PFOA, PFOS, and PFBS that apply to surface waters and "reflect the latest available scientific information including final human health toxicity values, draft bioaccumulation factors, draft relative source contributions, and updated drinking water ingestion rates."[76] Additionally, some states have adopted criteria for certain types of PFAS in surface waters. *See Table 12 (p. 39).*

The sampling data we collected detected elevated PFAS concentrations downstream from the WWTPs and biosolids land application sites that often exceeded SDWA MCLs for PFOA, PFOS, and/or PFHxS, and draft HHWQC (Water + Organism) for PFOA and PFOS and/or EWG's guidelines for multiple PFAS. *See Tables 13–15 (pp. 42–44).*

Table 12 | State, Federal, and EWG PFAS Criteria Applicable to Sampled Watersheds[77]

PFAS Analyte	Value (ppt)	Source[78]	Type	Note[79]
PFBA	1000	EWG	Health Guideline	
	1800	CT	DW Action Level	
PFPeA	1000	EWG	Health Guideline	
	70	RI	SW Quality Action Level	=> Sum of 8 PFAS
PFHxA	1000	EWG	Health Guideline	
	240	CT	DW Action Level	
	400,000	MI	MCL	
	70	RI	SW Quality Action Level	=> Sum of 8 PFAS
PFHpA	1000	EWG	Health Guideline	
	70	RI	SW Quality Action Level	=> Sum of 8 PFAS
PFOA	0.09	EWG	Health Guideline	
	4	EPA	MCL	
	0.0009	EPA	SW HH Water + Organism	
	0.007	CA	Public Health Goal	
	16	CT	DW Action Level	
	500	FL	HH SW Screening Level	
	8	MI	MCL	
	66	MI	SW Noncancer (DW)	
	10	NY	MCL	
	6.7	NY	Ambient WQ for HH (DW)	
	30	OR	DW Health Advisory Level	=> Sum of 4 PFAS
	70	RI	SW Quality Action Level	=> Sum of 8 PFAS
	20	RI	MCL	
	10	WA	DW Action Level	
	70	WI	MCL	Alone or +PFOS
	20	WI	SW Quality (DW)	
PFNA	0.006	EWG	Health Guideline	
	10	EPA	MCL	
	n/a	EPA	Hazard Index of 1 (unitless)	PFHxS, PFNA, HFPO-DA, and PFBS
	12	CT	DW Action Level	
	6	MI	MCL	
	30	OR	DW Health Advisory Level	=> Sum of 4 PFAS
	70	RI	SW Quality Action Level	=> Sum of 8 PFAS
	9	WA	DW Action Level	
PFDA	0.006	EWG	Health Guideline	
	70	RI	SW Quality Action Level	=> Sum of 8 PFAS
PFUnA	0.006	EWG	Health Guideline	
PFDoA	0.006	EWG	Health Guideline	
PFTrDA	0.006	EWG	Health Guideline	
PFTeA	0.006	EWG	Health Guideline	

Table 12 | State, Federal, and EWG PFAS Criteria Applicable to Sampled Watersheds[77]

PFAS Analyte	Value (ppt)	Source[78]	Type	Note[79]
PFBS	2000	EWG	Health Guideline	
	n/a	EPA	Hazard Index of 1 (unitless)	PFHxS, PFNA, HFPO-DA, and PFBS
	400	EPA	SW HH Water + Organism	
	500	CA	Health Notification Level	
	760	CT	DW Action Level	
	420	MI	MCL	
	345	WA	DW Action Level	
PFPeS	1	EWG	Health Guideline	
PFHxS	0.001	EWG	Health Guideline	
	10	EPA	MCL	
	n/a	EPA	Hazard Index of 1 (unitless)	PFHxS, PFNA, HFPO-DA, and PFBS
	3	CA	Health Notification Level	
	49	CT	DW Action Level	
	140	MD	DW Health Advisory Level	
	51	MI	MCL	
	59	MI	SW Noncancer (DW)	
	30	OR	DW Health Advisory Level	=> Sum of 4 PFAS
	1	RI	SW Quality Action Level	=> Sum of 8 PFAS
	20	RI	MCL	
	65	WA	DW Action Level	
PFHpS	0.001	EWG	Health Guideline	
PFOS	0.3	EWG	Health Guideline	
	4	EPA	MCL	
	0.06	EPA	SW HH Water + Organism	
	1	CA	Public Health Goal	
	10	CT	DW Action Level	
	10	FL	HH SW Screening Level	
	16	MI	MCL	
	11	MI	SW Noncancer (DW)	
	10	NY	MCL	
	2.7	NY	Ambient WQ for HH (DW)	
	30	OR	DW Level	=> Sum of 4 PFAS
	70	RI	SW Quality Action Level	=> Sum of 8 PFAS
	20	RI	MCL	
	15	WA	DW Action Level	
	70	WI	MCL	Alone or +PFOS
	8	WI	SW Quality (All Waters)	

Table 12 | State, Federal, and EWG PFAS Criteria Applicable to Sampled Watersheds[77]

PFAS Analyte	Value (ppt)	Source[78]	Type	Note[79]
PFNS	1	EWG	Health Guideline	
PFDS	0.001	EWG	Health Guideline	
PFDoS	1	EWG	Health Guideline	
FOSA	0.3	EWG	Health Guideline	
NMeFOSAA	1	EWG	Health Guideline	
NEtFOSAA	1	EWG	Health Guideline	
4:2 FTS	1	EWG	Health Guideline	
6:2 FTS	1	EWG	Health Guideline	
8:2 FTS	1	EWG	Health Guideline	
NEtFOSA	1	EWG	Health Guideline	
NMeFOSA	1	EWG	Health Guideline	
NMeFOSE	1	EWG	Health Guideline	
NEtFOSE	1	EWG	Health Guideline	
9Cl-PF3ONS	1	EWG	Health Guideline	
	2	CT	DW Action Level	
GenX	9	EWG	Health Guideline	
	10	EPA	MCL	
	n/a	EPA	Hazard Index of 1 (unitless)	PFHxS, PFNA, HFPO-DA, and PFBS
	19	CT	DW Action Level	
	370	MI	MCL	
11Cl-PF3OUdS	1	EWG	Health Guideline	
	5	CT	DW Action Level	
ADONA	1	EWG	Health Guideline	
3:3 FTCA				
5:3 FTCA				
7:3 FTCA				
NFDHA				
PFMBA	1	EWG	Health Guideline	
PFMPA	1	EWG	Health Guideline	
PFEESA		EWG	Health Guideline	

Table 13 | Exceedances of MCLs in Elevated Samples Downstream from WWTPs and Biosolids Land Application Sites

State	Waterbody	Waterkeeper	Analyte Amounts (ppt)			EPA MCL		
			PFOA	PFOS	PFHxS	PFOA	PFOS	PFHxS
Wastewater Treatment Sites								
AL	Cahaba River	Cahaba Riverkeeper	4.90			4	4	10
CA	Santa Ana River [Aug.] ▾	Inland Empire Waterkeeper	13.00	12.00		4	4	10
CT	Naugatuck River	Long Island Soundkeeper		8.30		4	4	10
FL	East Canal ▾	Tampa Bay Waterkeeper	7.10	11.00		4	4	10
MD	Monocacy River	Potomac Riverkeeper	6.80			4	4	10
MI	Rouge River	Detroit Riverkeeper	44.00		16.00	4	4	10
NC	Cape Fear River	Cape Fear Riverkeeper	8.30	13.00		4	4	10
	Haw River	Haw Riverkeeper	10.00	23.00		4	4	10
NJ	Ramapo River [Nov.]	Hackensack Riverkeeper	6.70	4.70		4	4	10
SC	Pocotaligo River	Black-Sampit Riverkeeper	28.00	30.00		4	4	10
TX	Hunting Bayou	Bayou City Waterkeeper	4.00	12.00		4	4	10
WI	Root River ©	Milwaukee Riverkeeper	8.00	5.00		4	4	10
WV	Opequon Creek	Upper Potomac Riverkeeper	4.10			4	4	10
Biosolids Application Sites								
AL	Cane Creek ©	Cahaba Riverkeeper Black Warrior Riverkeeper	4.10	5.80		4	4	10
NC	South River ©	Cape Fear Riverkeeper	5.80	7.50		4	4	10

Note: Only includes values that were elevated in comparison to upstream sites, except where as noted with an ▾ there was no upstream site.
© **Combined:** The result represents the highest concentration in either the primary or duplicate sample.

Samples upstream from WWTPs and biosolids land application fields also frequently exceeded these criteria. For example, the concentration of PFOS (11 ppt) and PFHxS (15 ppt) exceeded the MCL upstream from the Riverside RWQCP in the Santa Ana River (CA) [Nov.] and the concentration of PFOA (32 ppt) and PFOS (36 ppt) exceeded the MCL upstream from the Graham WWTP biosolids land application site in Haw Creek (NC). See Appendix A.

However, except where otherwise noted, the evaluation in Table 13 *(above)* and Table 14 *(p. 43)* only assesses downstream results where the downstream concentration exceeded the upstream concentration. These results are particularly concerning given the fact that the values are equilibrium concentrations that are more reflective of bioavailability, toxicity, and risk.

Table 14 | Exceedances of EPA HHWQC (Water + Organism) in Elevated Samples Downstream from WWTP and Biosolids Sites

State	Waterbody	Waterkeeper	PFOA Amounts (ppt)			PFOS Amounts (ppt)		
			Sample Results	EPA Criteria	Excess Amount	Sample Results	EPA Criteria	Excess Amount
Wastewater Treatment Sites								
AL	Cahaba River	Cahaba Riverkeeper	4.90	0.0009	4.8991			
	Big Wills Creek	Coosa Riverkeeper	2.20	0.0009	2.1991			
CA	Santa Ana River [Aug.] ▾	Inland Empire Waterkeeper	13.00	0.0009	12.9991	12.00	0.06	11.94
CT	Naugatuck River	Long Island Soundkeeper				8.30	0.06	8.24
FL	East Canal ▾	Tampa Bay Waterkeeper	7.10	0.0009	7.0991	11.00	0.06	10.94
GA	Chattahoochee River	Chattahoochee Riverkeeper	2.80	0.0009	2.7991			
MD	Monocacy River	Potomac Riverkeeper	6.80	0.0009	6.7991			
MI	Rouge River	Detroit Riverkeeper	44.00	0.0009	43.9991	3.10	0.06	3.04
MS	Pearl River ▾	Pearl Riverkeeper	2.90	0.0009	2.8991	3.50	0.06	3.44
NC	Cape Fear River	Cape Fear Riverkeeper	8.30	0.0009	8.2991	13.00	0.06	12.94
	Haw River	Haw Riverkeeper	10.00	0.0009	9.9991	23.00	0.06	22.94
NJ	Ramapo River [Nov.]	Hackensack Riverkeeper	6.70	0.0009	6.6991	4.70	0.06	4.64
OR	Tualatin River	Tualatin Riverkeepers	3.30	0.0009	3.2991	2.50	0.06	2.44
SC	Pocotaligo River	Black-Sampit Riverkeeper	28.00	0.0009	27.9991	30.00	0.06	29.94
TX	Hunting Bayou	Bayou City Waterkeeper	4.00	0.0009	3.9991	12.00	0.06	11.94
VA	Appomattox River	James Riverkeeper	2.60	0.0009	2.5991	2.60	0.06	2.54
WA	Spokane River	Spokane Riverkeeper	1.10	0.0009	1.0991	2.10	0.06	2.04
WI	Root River ©	Milwaukee Riverkeeper	8.00	0.0009	7.9991	5.00	0.06	4.94
WV	Opequon Creek	Upper Potomac Riverkeeper	4.10	0.0009	4.0991			
Biosolids Application Sites								
AL	Cane Creek ©	Cahaba Riverkeeper/ Black Warrior Riverkeeper	4.10	0.0009	4.0991	5.80	0.06	5.74
MS	Pearl River	Pearl Riverkeeper				3.60	0.06	3.54
NC	South River ©	Cape Fear Riverkeeper	5.80	0.0009	5.7991	7.50	0.06	7.44
VA	Old Town Creek ▾	James Riverkeeper	3.90	0.0009	3.8991	3.10	0.06	3.04
WA	Dragoon Creek	Spokane Riverkeeper	1.50	0.0009	1.4991			

Note: Only includes values that were elevated in comparison to upstream sites, except where as noted with an ▾ there was no upstream site.
© **Combined:** The result represents the highest concentration in either the primary or duplicate sample.

Table 15 | Exceedances of EWG Criteria in Elevated Samples Downstream from WWTPs and Biosolids Land Application Sites

State	Waterbody	Amounts by Analyte (ppt)														
		PFOA	PFOS	PFHxS	PFNA	PFDA	FOSA	PFDoA	6:2 FTS	PFUnA	PFTeA	PFPeS	NMeFOSAA	PFMPA	PFMBA	PFHpS
EWG Criteria Amount		0.09	0.3	0.001	0.006	0.006	0.3	0.006	1.00	0.006	0.006	1.00	1.00	1.00	1.00	0.001
Wastewater Treatment Sites																
AL	Cahaba River	4.90		1.50												
	Big Wills Creek	2.20		0.64			1.60									
CA	Santa Ana River [Aug.] ▾	13.00	12.00		2.10										6.10	
	Los Angeles River					2.10										
CT	Naugatuck River		8.30	1.70												
FL	East Canal ▾	7.10	11.00	3.90	1.30											
GA	Chattahoochee River	2.80						1.20			4.10			2.10		
MD	Monocacy River	6.80		2.50			0.62									
MI	Rouge River	44.00	3.10	16.00		5.00										
MS	Pearl River ▾	2.90	3.50	1.30	0.71											
NC	Haw River	10.00	23.00	4.50	2.20	2.60		0.59	1.10	0.87						
	Cape Fear River	8.30	13.00	5.30												
NJ	Ramapo River [Nov.]	6.70	4.70	3.50												
OR	Tualatin River	3.30	2.50	0.73	0.59											
RI	Pawtuxet River ©			2.30	2.10											
SC	Pocotaligo River	28.00	30.00		2.30	2.10	1.70		22.00	0.79			1.10			
TX	Hunting Bayou	4.00	12.00		1.30	0.64										
VA	Appomattox River	2.60	2.60		0.75											
WA	Spokane River	1.10	2.10	0.80												
WI	Root River ©	8.00	5.00	2.10	1.30	0.83										
WV	Opequon Creek	4.10														
	Ohio River															
Biosolids Application Sites																
AL	Cane Creek ©	4.10	5.80		0.68											
NC	Haw Creek				1.90	0.81						2.20				1.30
	South River ©	5.80	7.50	2.40	1.40		0.86									
MD	Monocacy River				0.77											
MS	Pearl River		3.60			0.73										
VA	Old Town Creek ▾	3.90	3.10	1.50												
WA	Dragoon Creek	1.50		0.71			0.88									

Note: Only includes values that were elevated in comparison to upstream sites, except where as noted with an ▾ there was no upstream site.
© **Combined:** The result represents the highest concentration in either the primary or duplicate sample.

As shown in Table 13 *(p. 42)* and Figure 15 [WWTPs] *(p. 46)*:

1. The MCL for PFOA was exceeded at 12 downstream WWTP sites and two downstream biosolids land application sites.
   - ↳ In the Pocotaligo River downstream from the Sumter Pocotaligo River Plant in South Carolina, PFOA exceeded the MCL of 4 ppt by 24 ppt.
   - ↳ In the Rouge River downstream from the GLWA WRRF in Michigan, PFOA exceeded the MCL of 4 ppt by 40 ppt.
   - ↳ In the Santa Ana River [Aug.] downstream from the Riverside RWQCP in California, PFOA exceeded the MCL of 4 ppt by 9 ppt.
2. The MCL for PFOS was exceeded at nine downstream WWTP sites and two downstream biosolids land application sites.
   - ↳ In the Pocotaligo River downstream from the Sumter Pocotaligo River Plant in South Carolina, PFOS exceeded the MCL of 4 ppt by 26 ppt.
   - ↳ In the Haw River downstream from the Graham WWTP in North Carolina, PFOS exceeded the MCL of 4 ppt by 19 ppt.
   - ↳ In the Cape Fear River downstream from the Fayetteville Cross Creek WRF, PFOS exceeded the MCL of 4 ppt by 9 ppt.
3. The MCL for PFHxS was exceeded at one downstream WWTP site.
   - ↳ In the Rouge River downstream from the GLWA WRRF in Michigan, PFHxS exceeded the MCL of 10 ppt by 6 ppt.

As shown in Table 14 *(p. 43)* and Figure 16 [WWTPs] *(p. 47)*:

1. The draft HHWQC (Water + Organism) for PFOA was exceeded at 18 downstream WWTP sites and 4 downstream biosolids land application sites.
   - ↳ In the Pocotaligo River downstream from the Sumter Pocotaligo River Plant in South Carolina, PFOA exceeded the draft HHWQC of 0.0009 ppt by 27.9991 ppt.
   - ↳ In the Rouge River downstream from the GLWA WRRF in Michigan, PFOA exceeded the draft HHWQC of 0.0009 ppt by 43.9991 ppt.
   - ↳ In the South River downstream from Fayetteville Cross Creek's biosolids land application fields in North Carolina, PFOA exceeded the draft HHWQC of 0.0009 ppt by 5.7991 ppt.
2. The draft HHWQC (Water + Organism) for PFOS was exceeded at 14 downstream WWTP sites and 4 downstream biosolids land application sites.
   - ↳ In the Pocotaligo River downstream from the Sumter Pocotaligo River Plant in South Carolina, PFOS exceeded the draft HHWQC of 0.06 by 29.94 ppt.
   - ↳ In the Haw River downstream from the Graham WWTP in North Carolina, PFOS exceeded the draft HHWQC of 0.06 by 22.94 ppt.
   - ↳ In the South River downstream from Fayetteville Cross Creek's biosolids land application fields in North Carolina, PFOS exceeded the draft HHWQC of 0.06 by 7.44 ppt.

WATERKEEPER ALLIANCE | PFAS REPORT PHASE II
ANALYSIS AND FINDINGS

Figure 15 | Exceedances of EPA PFAS MCLs Downstream from WWTP Outfalls
Includes Only Sites Where Downstream PFAS Concentrations Exceeded Upstream PFAS Concentrations •

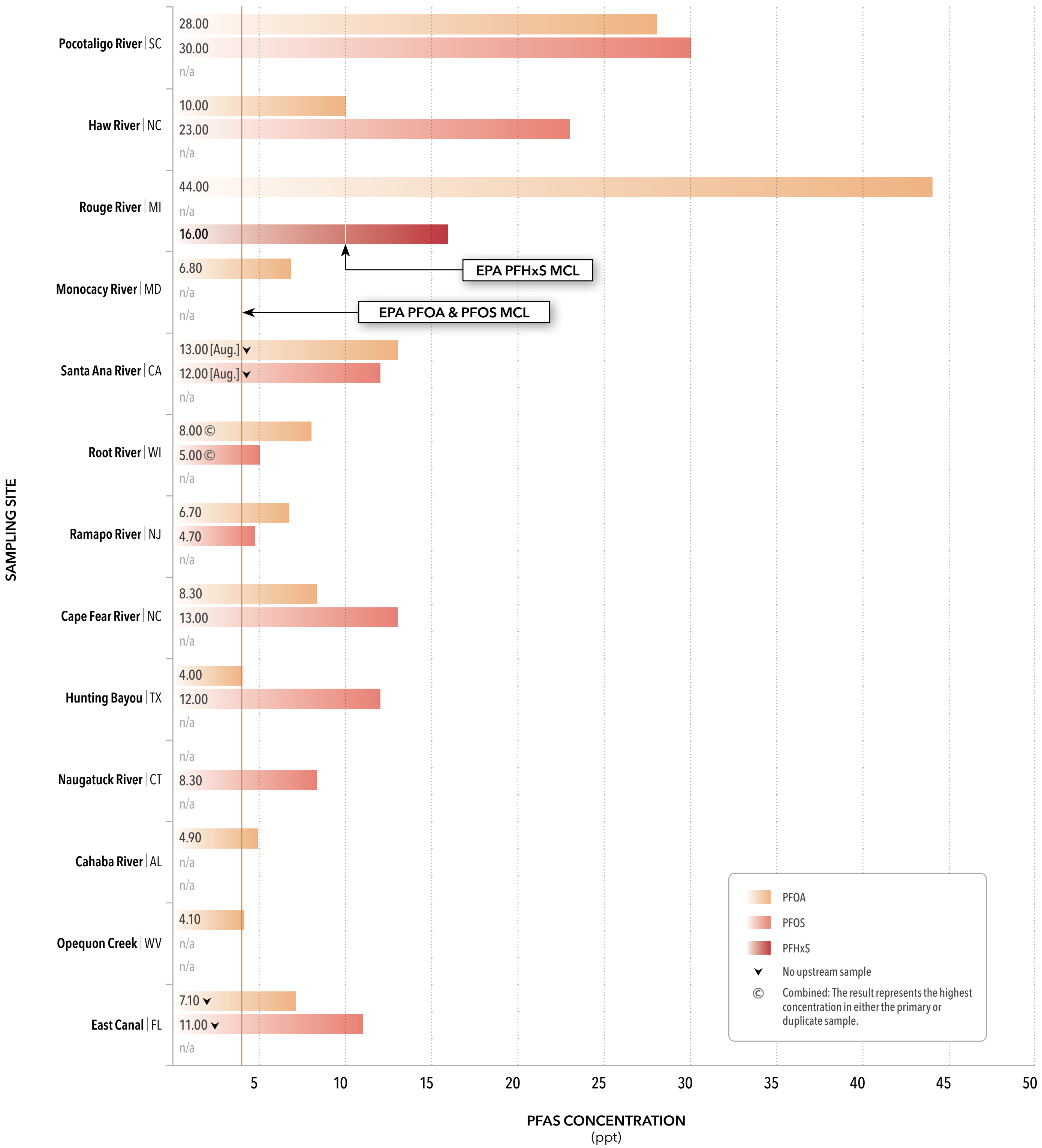
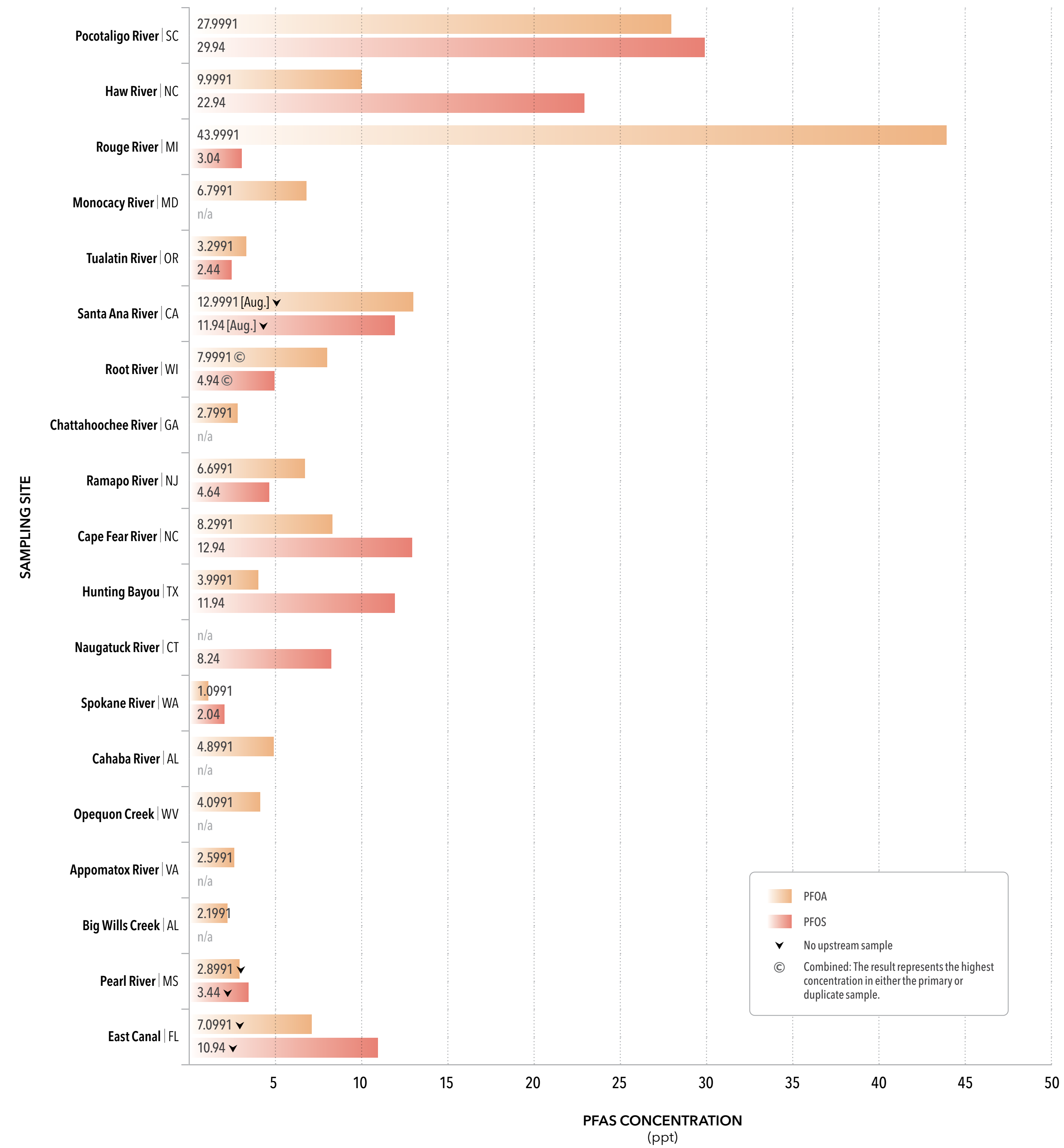


Figure 16 | Exceedances of Draft HHWQC (Water + Organism) Downstream from WWTPs
Includes Only Sites Where Downstream Concentrations Exceeded Upstream PFAS Concentrations

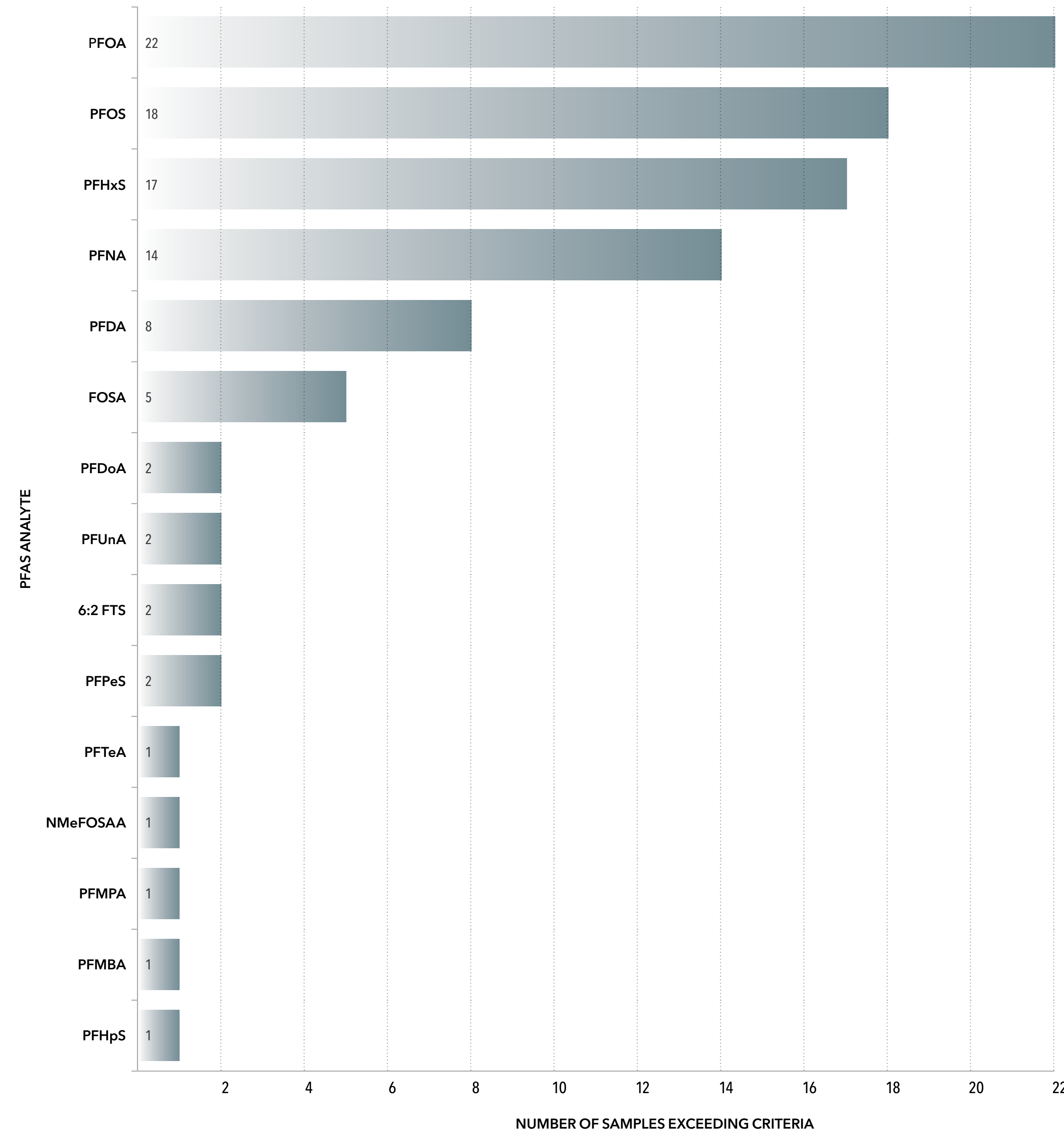


As shown in Table *15 (p. 44)* and *Figure 17 [WWTPs and Biosolids] (p. 49)*, EWG's health-based criteria were exceeded at 29 locations downstream from WWTP sites and biosolids land application sites. The PFAS types that most frequently exceeded EWG's criteria at the greatest number of elevated downstream sites were:

- PFOA (22 sites)
- PFOS (18 sites)
- PFHxS (17 sites)
- PFNA (14 sites)

1. There are no federal standards for PFDA, which is a "[b]reakdown product of stain- and grease-proof coatings on food packaging, couches, carpets."[80] It was detected at higher concentrations in sampling sites downstream from six WWTPs and two biosolids land application fields at levels that exceed EWG's health-based criteria. Based on "EPA's toxicity value published in the Integrated Risk Information System's toxicological review," the EWG criteria for PFDA is 0.006 ppt to protect against developmental and immune harm in humans.[81]
   - ↳ In the Rouge River downstream from the GLWA WRRF in Michigan, the PFDA concentration was 5 ppt.
   - ↳ In the Haw River downstream from the Graham WWTP in North Carolina, the PFDA concentration was 2.6 ppt.
   - ↳ In the Los Angeles River downstream from the LA-Glendale WRP in California, the PFDA concentration was 2.1 ppt.
   - ↳ In Haw Creek downstream from the Graham WWTP biosolids land application field in North Carolina, the PFDA concentration was 0.81 ppt.
2. There are no federal standards for FOSA, which is widely used in industrial processes.[82] It was detected at higher concentrations in sampling sites downstream from three WWTPs and two biosolids land application fields at levels that exceed EWG's health-based criteria. Based on "EPA's final toxicity value for PFOS from the Office of Water's Final Human Health Toxicity Assessment," the EWG criteria for FOSA is 0.3 ppt to protect against cardiovascular harm and harm to fetal growth in humans.[83]
   - ↳ In the Pocotaligo River downstream from the Sumter Pocotaligo River Plant in South Carolina, the FOSA concentration was 1.7 ppt.
   - ↳ In Big Wills Creek downstream from the Rainbow City WWTP in Alabama, the FOSA concentration was 1.6 ppt.
   - ↳ In the Monocacy River downstream from the City of Frederick WWTP in Maryland, the FOSA concentration was 0.62 ppt.
   - ↳ In Dragoon Creek downstream from the Spokane Riverside Park WRF's biosolids land application fields in Washington, the FOSA concentration was 0.88 ppt.
   - ↳ In the South River downstream from Fayetteville Cross Creek's biosolids land application fields in North Carolina, the FOSA concentration was 0.86 ppt.

Figure 17 | Number of Elevated Downstream Samples Exceeding EWG Criteria
Downstream from Wastewater Treatment Plants and Biosolids Land Application Sites



Note: Santa Ana, CA [Aug.] and East Canal, FL did not obtain upstream samples.

3. There are no federal standards for 6:2 FTS, which is used as a replacement for PFOS in aqueous film-forming foam and in the chromium electroplating industry.[84] It was detected at higher concentrations in sampling sites downstream from two WWTPs at levels that exceed EWG's health-based criteria. "[B]ased on studies by Phillipe Grandjean of Harvard University and many other independent researchers," the EWG criteria for 6:2 FTS is 1 ppt to protect against adverse human health effects.[85]
   - In the Pocotaligo River downstream from the Sumter Pocotaligo River Plant in South Carolina, the 6:2 FTS concentration was 22 ppt.[86]
   - In the Haw River downstream from the Graham WWTP in North Carolina, the 6:2 FTS concentration was 1.1 ppt.

4. There are no federal standards for PFTeA, which is used in a wide variety of consumer products.[87] It was detected at higher concentrations in sampling sites downstream from one WWTP at levels that exceed EWG's health-based criteria. "[B]ased on EPA's recommended application of the toxicity value for PFDA published in the Integrated Risk Information System's toxicological review," the EWG criteria for PFTeA is 0.006 ppt to protect against harm to the immune system and harm to fetal growth and child development.[88]
   - In the Chattahoochee River downstream from the City of Atlanta's R.M. Clayton WRC, Cobb County's R.L. Sutton WRF, and the West Area WQCF in Georgia, the PFTeA concentration was 4.1 ppt.

5. There are no federal standards for PFHpS, which is used in many consumer products. It was detected at higher concentrations in sampling sites downstream from one biosolids land application site at levels that exceed EWG's health-based criteria. Based on "EPA's recommended application of the PFHxS toxicity value published in the Integrated Risk Information System's toxicological review," the EWG criteria for PFHpS is 0.001 ppt to protect against cancer, endocrine disruption, accelerated puberty, liver and immune system damage, and thyroid changes.[89]
   - In Haw Creek downstream from the Graham WWTP biosolids land application field in North Carolina, the PFHpS concentration was 1.3 ppt.

6. There are no federal standards for PFMBA, which is used in many consumer products. It was detected at higher concentrations in sampling sites downstream from one WWTP at levels that exceed EWG's health-based criteria. "[B]ased on studies by Phillipe Grandjean of Harvard University and many other independent researchers," the EWG criteria for PFMBA is 1 ppt to protect against adverse human health effects.[90]
   - In the Santa Ana River [Aug.] downstream from the Riverside RWQCP in California, the concentration of PFMBA was 6.1 ppt.

EVALUATION OF FACILITIES AND WATERSHEDS

To further evaluate the contribution of PFAS to the sampled watersheds, we conducted a comparative analysis of upstream and downstream results for each of the WWTPs and biosolids land application fields, and we assessed the results in relation to the available criteria for evaluating human health risks. Additionally, we reviewed information about the facilities from publicly available sources and EJScreen data to better understand the potential sources and environmental justice implications of PFAS contamination. This information was obtained from state agencies, EPA, the facilities' webpages, public information requests, and other online resources. Statements made herein about the facilities and industrial users rely on the accuracy and completeness of these sources. While we undertook a thorough review of available, but often limited information, we make no independent representation of these facts. The results of our evaluation are set forth below. EPA EJScreen Enforcement and Compliance History Online (ECHO) and Community Reports discussed for each facility can be found in Appendix B.

Nearly all of the WWTPs evaluated in this project accept discharges into their treatment systems from industrial users. Yet, based on our review of public records, it appears the overwhelming majority of the WWTPs do not place any PFAS limits on these users. This is concerning given the fact that a significant number of these industrial users operate in sectors known for producing and/or utilizing PFAS. Based on information taken from EPA's PFAS Analytic Tools, which is a publicly available online repository of PFAS data collected by the agency, we determined that most WWTPs are likely receiving discharges from at least one permitted industrial user that is "operat[ing] in sectors that have been identified as possibly handling, using, or releasing PFAS chemicals." Frequently, the data indicates that there may be additional unpermitted industrial users of these systems that have been identified in the database.

To effectively stem the tide of PFAS contamination in U.S. waterways, federal and state governments must prioritize regulation of the industrial sources from which it originates. Industry, which profits from the use of these toxic chemicals, must also be required to share the financial burden of cleaning up its PFAS pollution. Otherwise, WWTPs, and the communities that rely on them, will be forced to shoulder that burden alone. This is not only a matter of fairness; it also makes financial sense given that controlling PFAS at the source is significantly less costly than trying to remove it at the wastewater or drinking water utility level.[91]

EPA's own investigations have confirmed both the extent of PFAS contamination in industrial wastewater and the need for pretreatment solutions to sufficiently address the problem. In 2021, EPA studied industrial discharges of PFAS from five industrial categories, including: Organic Chemicals, Plastics, and Synthetic Fibers Manufacturing; Metal Finishing; Pulp, Paper and Paperboard Manufacturing; Textile Mills; and Commercial Airports. The Agency found that "[f]ew facilities in these industries currently have monitoring requirements, effluent limitations, or pretreatment standards for PFAS in their wastewater discharge permits."[92] It then "identified available wastewater treatment technologies, such as activated carbon, ion exchange, and membrane filtration, that may reduce PFAS in wastewater discharges from facilities in these industrial point source categories."[93] Pretreatment technologies such as these currently exist and have been found to be both cost-effective and successful in reducing concentrations of PFOA and PFOS.[94] Given the apparent extent of industry's contribution to PFAS pollution in WWTPs, it is imperative that federal and state governments incorporate pretreatment technologies into their strategies to protect public health in their communities.

WATERSHEDS WITH THE GREATEST DOWNSTREAM TOTAL PFAS CONCENTRATION INCREASES

We generated more detailed evaluations for watersheds where the WWTPs and biosolids land application fields had the greatest increases in total PFAS concentrations between upstream and downstream sampling sites. These evaluations are presented below by Waterkeeper group watershed.

Black-Sampit Riverkeeper, Pocotaligo River, South Carolina

Wastewater Treatment Plant Site

According to its 2017 NPDES permit application, the Sumter Pocotaligo River WWTP is a municipal wastewater treatment system that is owned and operated by the City of Sumter's Wastewater Division of the Utilities Department and serves 51,000 people. In addition, the facility handles wastewater from numerous industrial dischargers, including four permitted Significant Industrial Users and 20 permitted Categorical Industrial Users. The WWTP discharges treated wastewater into the East Branch of the Pocotaligo River at an average design flow of 15 MGD. The Pocotaligo River Watershed makes up 171,780 acres of the Upper Coastal Plain region of South Carolina. According to ECHO, Sumter is located in an area with four State EJ Indexes and six Federal EJ Indexes greater than the state's 80th percentile within one mile of the facility, including wastewater discharges at 87 (State).[95] According to the EPA EJScreen, of people living within one mile of Sumter WWTP, 65% are people of color and 42% are low income.[96]

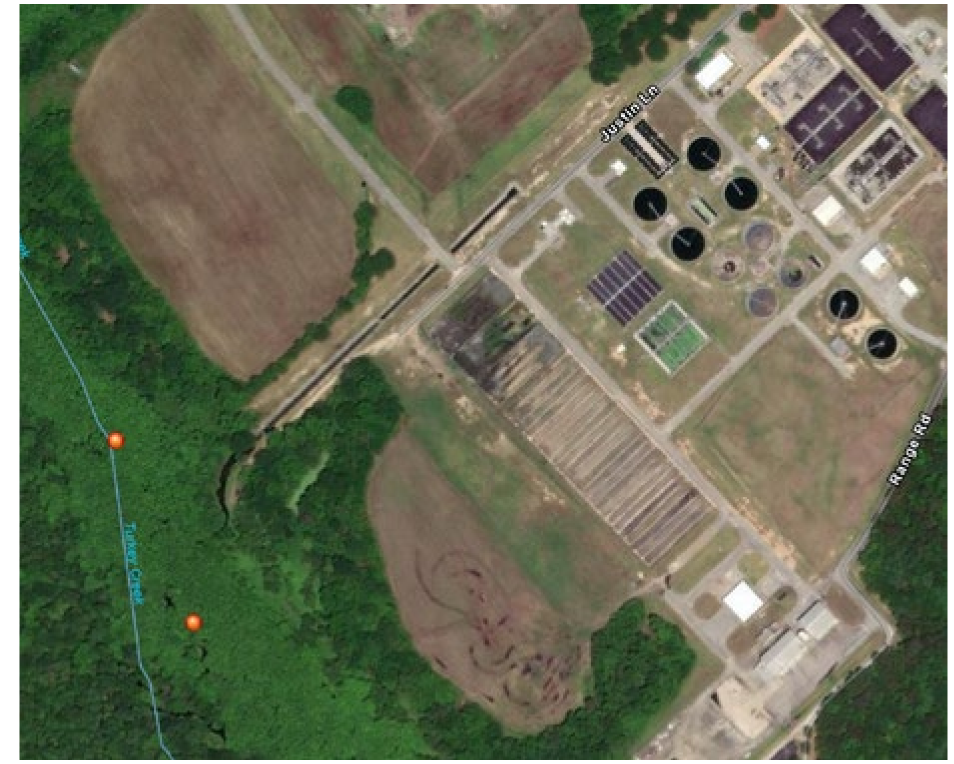
The NPDES permit for Sumter WWTP does not include any limits on the amount of PFAS the facility discharges into the Pocotaligo River and there are no pretreatment limits to control PFAS discharges to the WWTP by industrial dischargers. Of the 24 permitted industrial users discharging wastewater to Sumter Pocotaligo River WWTP, EPA's PFAS Analytic Tools[97] lists the following 11 as facilities "operat[ing] in sectors that have been identified as possibly handling, using, or releasing PFAS chemicals":

- Apex Tools (Metal Coating)
- Armoloy Southeast (Metal Coating)
- Continental Tire (Consumer Products)
- EMS – chemie (Plastics and Resins)
- Enersys – Sumter Metals (Metal Machinery Mfg.)
- GRR (Waste Management)
- Interlake Mecalux (Metal Machinery Mfg.)
- Metal Finishing Services, Inc. (Metal Coating)
- Metokote Corporation (Metal Coating)
- Phibro – Tech, Inc. (Chemical Mfg.)
- Santee Print Works (Textiles and Leather)

There are likely additional unpermitted industrial dischargers contributing PFAS to the WWTP given that EPA's PFAS Analytic Tools identifies 40 facilities located within the City of Sumter that operate in PFAS-related sectors, including:

- Airports
- Chemical Mfg.
- Consumer Products
- Electronics Industry
- Glass Products
- Metal Coating
- Metal Machinery Mfg.
- National Defense
- Paints and Coatings
- Plastics and Resins
- Textiles and Leathers
- Waste Management

Sumter Pocotaligo WWTP | Pocotaligo River



PFAS Phase II Sampling Site

From 2022 to 2023, as part of the state's Ambient Surface Water PFAS Project,[98] the South Carolina Department of Environmental Services tested for a series of 26 PFAS or precursor compounds in ambient surface water at locations upstream and downstream from Sumter Pocotaligo River WWTP's outfall. The results show significant increases in the average concentrations of multiple types of PFAS between the upstream monitoring location and the closest downstream monitoring location, for example:

- PFOS (12.1 ppt to 62.93 ppt)
- PFHxA (5.69 ppt to 84.67 ppt)
- PFPeA (5.29 ppt to 69.03 ppt)
- 6:2 FTS (N.D. to 53.95 ppt)

Sampling conducted by Black-Sampit Riverkeeper in December 2023 also detected significant increases in PFAS downstream from the Sumter Pocotaligo River WWTP's outfall, particularly PFPeA (<1 ppt to 110.9 ppt) and PFHxA (2 ppt to 194.7 ppt).

For Phase II, Black-Sampit Riverkeeper deployed PFASsive™ passive sampling devices upstream and downstream from the WWTP's outfall to the East Branch of the Pocotaligo River from August 23, 2024 to September 25, 2024. Both upstream and downstream sampling sites detected multiple types of regulated and unregulated PFAS.[99] However, the concentrations of multiple types of PFAS increased significantly at the downstream site, resulting in a total PFAS concentration of 228.39 ppt. With an increase of 118.01 ppt (106.91%), this site became the most contaminated location detected in this monitoring project.

For example, the concentration of PFHxA increased from 9.6 ppt to 49 ppt (410.42%), the concentration of PFPeA increased from 9.7 ppt to 38 ppt (291.75%), and the concentration of PFHpA increased from 4 ppt to 21 ppt (425%). Multiple other types of PFAS increased in downstream samples at levels ranging from 21.74% to 144.9%, including 6:2 FTS, which increased from non-detect to 22 ppt. These results are consistent with the findings of previous sampling, and indicate that the Sumter Pocotaligo River WWTP's outfall is likely a significant source of PFAS in the Pocotaligo River.

Downstream concentrations of PFAS demonstrate that the surface water at this location is unsafe for drinking without advanced treatment. For example, the concentration of PFOA at the downstream location was 28 ppt, which is 24 ppt greater than the MCL of 4 ppt, and the concentration of PFOS was 30 ppt, which is 26 ppt greater than the MCL of 4 ppt.

The concentrations of PFOA and PFOS in the downstream samples were also greater than the draft HHWQC (Water + Organism). Specifically, PFOA exceeded the criteria of 0.0009 ppt by 27.9991 ppt, and PFOS exceeded the 0.06 criteria by 29.94 ppt.

Table 16 | Pocotaligo River Upstream and Downstream from Sumter WWTP

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	Upstream	Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFHxA	9.60	49.00	39.40	410.42%					1000	
PFPeA	9.70	38.00	28.30	291.75%					1000	
6:2 FTS	0.00	22.00	22.00	n/a					1	21.000
PFHpA	4.00	21.00	17.00	425.00%					1000	
PFOS	22.00	30.00	8.00	36.36%	4	26.00	0.06	29.94	0.3	29.700
PFBA	4.90	12.00	7.10	144.90%					1000	
PFOA	23.00	28.00	5.00	21.74%	4	24.00	0.0009	27.9991	0.09	27.910
PFBS	3.10	5.50	2.40	77.42%			400		2000	
PFDA	0.00	2.10	2.10	n/a					0.006	2.094
FOSA	0.00	1.70	1.70	n/a					0.3	1.400
PFNA	1.50	2.30	0.80	53.33%	10				0.006	2.294
PFUnA	0.00	0.79	0.79	n/a					0.006	0.784
NMeFOSAA	0.66	1.10	0.44	66.67%					1	0.100
PFPeS	1.20	1.10	-0.10	-8.33%					1	0.100
NEtFOSAA	0.72	0.00	-0.72	-100.00%					1	
PFHxS	14.00	6.60	-7.40	-52.86%	10				0.001	6.599
HFPO-DA (GenX)	16.00	7.20	-8.80	-55.00%	10				9	
Total PFAS	110.38	228.39	118.01	106.91%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

There are no national or state Clean Water Act ambient surface water quality criteria for most PFAS detected at elevated levels, such as PFHxA, PFPeA, 6:2 FTS, PFHpA, PFBA, FOSA, PFNA, and PFUnA. However, several PFAS without federal or state standards, including PFDA, PFUnA, PFPeS, 6:2 FTS, FOSA, and NMeFOSAA, exceeded EWG's health-based criteria, as did PFNA. *See Table 16 (above).*

This evaluation indicates that Sumter Pocotaligo River WWTP is contributing a significant amount of PFAS to the Pocotaligo River and that multiple industrial dischargers are likely contributing to the WWTP's discharge of PFAS to the river. This pollution will likely continue to pose significant risks to human health until pretreatment limits are imposed on industrial sources discharging into the WWTP, and a PFAS limit is included in the Sumter Pocotaligo River WWTP's NPDES permit. Implementing these measures will require the installation of advanced treatment technology and a plan to safely manage the contaminants removed during treatment.

Haw Riverkeeper, Haw River and Haw Creek, North Carolina

Wastewater Treatment Plant and Biosolids Sites

The Graham WWTP is a municipal wastewater treatment system that is owned and operated by the City of Graham that serves a population of close to 17,000 residents.[100] In addition, the facility handles wastewater from multiple industrial dischargers, including five permitted Significant Industrial Users, of which three are categorical. The WWTP discharges treated wastewater into the Haw River at an average design flow of 3.5 MGD. The Haw River, which flows 110 miles south to the Cape Fear River and joins the Jordan Lake Reservoir, spans a 1,700-square-mile watershed. The Haw River and its watershed provide drinking water to nearly one million people and supports diverse wildlife, including the endangered Cape Fear shiner.

According to ECHO, Graham WWTP is located in an area with eight State Supplemental EJ Indexes and seven Federal Supplemental EJ Indexes greater than the 80th percentile within one mile of the facility, including wastewater discharges at 97 (State).[101] According to the EPA EJScreen, of people living within one mile of Graham WWTP, 35% are people of color and 27% are low income.[102] Although Graham WWTP's NPDES permit[103] requires that the facility monitor for PFAS chemicals listed in Table 1 of EPA Method 1633 twice a year, the permit does not include any limits on the amount of PFAS the facility discharges.

EPA's PFAS Analytic Tools[104] identifies seven facilities in the City of Graham that are "operat[ing] in sectors that have been identified as possibly handling, using, or releasing PFAS chemicals." Specifically, those industry sectors include Chemical Mfg., Clean Product Mfg., Metal Coating, Paper Mills and Products, Plastics and Resins, and Waste Management. EPA's list of facilities does not include any of those that are permitted to discharge into Graham WWTP.

In 2019, North Carolina's Department of Environmental Quality (DEQ) determined that the Graham WWTP's influent was contaminated with PFAS. DEQ's sampling[105] detected the presence of 13 PFAS; three of which were detected at concentrations greater than 10 ppt: PFHxA (max. 11.8 ppt), PFPeA (max. 65.6 ppt), and PFOS (max. 12.8 ppt). That same year, Haw Riverkeeper tested water samples collected upstream and downstream of WWTPs along the Haw, including the Graham WWTP. Water samples taken from upstream and downstream of the facility outfall detected total PFAS concentrations of 33.14 ppt (upstream) and 44.75 ppt (downstream).

For this project, Haw Riverkeeper deployed PFASsive™ passive sampling devices immediately upstream and downstream from a Graham WWTP's outfall to the Haw River from August 12, 2024 to September 20, 2024. Both upstream and downstream sampling sites detected multiple types of PFAS. However, total PFAS concentrations increased significantly at the downstream site, rising by 66.47 ppt or 85.14%. For example, the concentration of PFPeA increased from 14 ppt to 36 ppt (157.14%), the concentration of PFDA increased from 1.2 ppt to 2.6 ppt

Graham WWTP | Haw River

PFAS Phase II Sampling Site

(116.67%), and the concentration of PFHxA increased from 13 ppt to 27 ppt (107.69%). Multiple other types of PFAS increased in downstream samples at levels ranging from 7.14% to 91.01%, including PFBS which increased from 8.9 ppt to 17 ppt. These results are consistent with the findings of previous sampling and indicate that the Graham WWTP's outfall is likely a significant source of PFAS in the Haw River.

Downstream concentrations of PFAS demonstrate that the surface water is unsafe for drinking without advanced treatment. For example, the concentration of PFOA at the downstream location was 10 ppt, which is 6 ppt greater than the MCL of 4 ppt, and the concentration of PFOS was 23 ppt, which is 19 ppt greater than the MCL of 4 ppt.

The concentrations of PFOA and PFOS in the downstream samples were also greater than the draft HHWQC (Water + Organism). Specifically, PFOA exceeded the criteria of 0.0009 ppt by 9.9991 ppt, and PFOS exceeded the 0.06 ppt criteria by 22.94 ppt. There are no national or state CWA surface water quality criteria for the protection of human health that apply to the majority of PFAS that were detected at elevated levels, including PFPeA, PFHxA, PFBA, PFHpA, PFDA, 6:2 FTS, PFMPA, PFUnA, PFNA, PFDoA, and PFHxS.

Additionally, numerous PFAS that do not have any federal or state regulatory standards significantly exceeded EWG's health-based criteria, including PFDA (also detected in 2019 NCDEQ Influent Sampling), PFUnA, PFDoA (also detected in 2019 NCDEQ Influent Sampling), and 6:2 FTS (also detected in 2019 NCDEQ Influent Sampling). PFNA and PFHxS also significantly exceeded EWG's health-based criteria. *See Table 17 (below).*

Table 17 | Haw River Upstream and Downstream from Graham WWTP

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	Upstream	Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFPeA	14.00	36.00	22.00	157.14%					1000	
PFHxA	13.00	27.00	14.00	107.69%					1000	
PFBS	8.90	17.00	8.10	91.01%			400		2000	
PFOS	17.00	23.00	6.00	35.29%	4	19.00	0.06	22.94	0.3	22.700
PFBA	5.10	9.20	4.10	80.39%					1000	
PFHpA	5.20	8.80	3.60	69.23%					1000	
PFOA	7.10	10.00	2.90	40.85%	4	6.00	0.0009	9.9991	0.09	9.910
PFDA	1.20	2.60	1.40	116.67%					0.006	2.594
6:2 FTS	0.00	1.10	1.10	n/a					1	0.100
PFMPA	0.00	0.88	0.88	n/a					1	
PFUnA	0.00	0.87	0.87	n/a					0.006	0.864
PFNA	1.50	2.20	0.70	46.67%	10				0.006	2.194
PFDoA	0.00	0.59	0.59	n/a					0.006	0.584
PFHxS	4.20	4.50	0.30	7.14%	10				0.001	4.499
PFPeS	0.87	0.80	-0.07	-8.05%					1	
Total PFAS	78.07	144.54	66.47	85.14%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

WATERKEEPER ALLIANCE | PFAS REPORT PHASE II
ANALYSIS AND FINDINGS

Graham WWTP Biosolids Fields | Haw Creek

PFAS Phase II Sampling Site Biosolids Land Application Sites

In addition to directly discharging wastewater into the Haw River, Graham WWTP is permitted[106] to operate a Residuals Land Application Program to land apply biosolids at nine fields owned by the City of Graham, all of which are located in the Haw River watershed. Graham WWTP produces Class B biosolids, and in 2023, Graham WWTP generated and land-applied 151.296 dry tons of its biosolids to six of the nine land application fields—a total of 51.6 acres.[107] In 2024, Graham WWTP land-applied 217.703 dry tons of its biosolids.[108]

For this project, Haw Riverkeeper also deployed PFASsive™ passive sampling devices in the Haw Creek immediately upstream and downstream from land application sites receiving biosolids from Graham WWTP. Those sampling devices were deployed from August 12, 2024 to September 20, 2024. Both upstream and downstream sampling sites detected multiple types of regulated and unregulated PFAS. It is notable that the upstream location had very high concentrations of certain types of PFAS, including PFOA and PFOS, as well as elevated concentrations of other PFAS.

The concentration of total PFAS increased at the downstream site by 3.91 ppt—an increase of 3.81%. For example, the concentration of PFBS increased from a non-detect to 5.3 ppt, and PFBA increased from a non-detect to 3.9 ppt.

Like the samples taken downstream from Graham WWTP's outfall, the PFAS concentrations downstream from Graham's land application site demonstrate that the surface water is unsafe for drinking without advanced treatment. For example, the concentration of PFOA at the downstream location was 29 ppt, which is 25 ppt greater than the MCL of 4 ppt, and the concentration of PFOS was 34 ppt, which is 30 ppt greater than the MCL of 4 ppt. The concentrations of PFOA and PFOS in the downstream samples also greatly exceeded draft HHWQC (Water + Organism), indicating that concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. In the downstream sample, PFOA exceeded the draft HHWQC (Water + Organism) of 0.0009 ppt by 28.9991 ppt, and PFOS exceeded the

Table 18 | Haw Creek Upstream and Downstream from Biosolids Site

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	Upstream	Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBS	0	5.3	5.3	n/a			400		2000	
PFBA	0	3.9	3.9	n/a					1000	
PFPeS	0	2.2	2.2	n/a					1	1.2
PFNA	0	1.9	1.9	n/a	10				0.006	1.894
PFHpS	0	1.3	1.3	n/a					0.001	1.299
PFDA	0	0.81	0.81	n/a					0.006	0.804
PFPeA	6.5	6.1	-0.4	-6.15%					1000	
PFHxA	9.5	8.8	-0.7	-7.37%					1000	
PFOS	36	34	-2	-5.56%	4	30	0.06	33.94	0.3	33.7
PFHxS	7.6	5.5	-2.1	-27.63%	10				0.001	5.499
PFOA	32	29	-3	-9.38%	4	25	0.0009	28.9991	0.09	28.91
PFHpA	11	7.7	-3.3	-30.00%					1000	
Total PFAS	102.6	106.51	3.91	3.81%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

0.06 ppt criteria by 33.94 ppt. There are no national or state Clean Water Act surface water quality criteria for the protection of human health that apply to the majority of PFAS that were detected at elevated levels, including PFBA, PFPeS, PFNA, PFHpS, and PFDA.

Additionally, numerous PFAS that do not have any federal or state regulatory standards significantly exceeded EWG's health-based criteria, including PFDA, PFPeS, and PFHpS. Elevated levels of PFNA also significantly exceeded EWG's health-based criteria. *See Table 18 (above).*

This evaluation indicates that Graham WWTP and its biosolids land application site in Haw Creek are contributing PFAS to the Haw River and that multiple industrial dischargers are likely contributing to the WWTP's discharge of PFAS to the river. This pollution will likely continue to create significant risks to human health until PFAS pretreatment limits are placed on industrial sources of PFAS discharging into the WWTP and PFAS limits are placed in the Graham WWTP's NPDES permit, which will require installation of PFAS treatment technology, limits on biosolids land application, and a plan to safely manage PFAS removed during the treatment process.

Detroit Riverkeeper, Rouge River, Michigan
Wastewater Treatment Plant Site

The Great Lakes Water Authority Water Resource Recovery Facility (GLWA WRRF) is a municipal wastewater treatment system that is owned and operated by the City of Detroit Board of Water Commissioners. This facility serves a population of approximately 2.8 million residents and is considered "the largest single-site treatment facility in North America."[109] GLWA WRFF accepts discharges from 234 permitted industrial users. GLWA WRRF discharges wastewater into the Rouge River and other locations.[110] The Rouge River is a tributary to the Detroit River and contributes to the Great Lakes Basin, one of the largest freshwater ecosystems, and the watershed is home to 1.35 million people in Oakland, Washtenaw, and Wayne counties.

The GLWA Wastewater Master Plan states that "[t]he permitted peak primary treatment capacity is 1,700 MGD (the largest in the nation) and the peak secondary treatment capacity is 930 MGD."[111] According to ECHO, GLWA WRRF is located in an area with 13 State Supplemental EJ Indexes and 13 Federal Supplement EJ Indexes greater than the 80th percentile within one mile of the facility, including wastewater discharges at 99 (State).[112] According to the EPA EJScreen, of people living within one mile of GLWA WRRF, 59% are people of color and 65% are low income.[113]

The NPDES permit for GLWA WRRF requires quarterly monitoring and reporting of PFAS in the facility's effluent. The permit also requires that GLWA WRRF submit a Pollutant Minimization and Source Evaluation Program for Perfluorooctane Sulfonate (PFOS) and/or Perfluorooctanoic Acid (PFOA) that will "identify and address sources of [PFOS] and/or [PFOA] and to reduce and maintain the effluent concentrations of PFOS and/or PFOA at or below the water quality standards (WQS) and/or the Water Quality-Based Effluent limit (WQBEL)."[114] The 2019 permit includes a goal of meeting the water quality standard for PFOS of 11 ppt and a WQBEL for PFOA of 8,040 ppt. For comparison, the EPA and MI MCLs are 4 ppt and 8 ppt respectively for PFOA and the National Recommended Ambient Water Quality Criteria for the Protection of Human Health includes a EPA Water + Organism Human Health Criteria of 0.0009 ppt for PFOA. Beyond these requirements, however, the permit does not include any limits on the amount of PFAS the facility discharges. In terms of the facilities' industrial dischargers, GLWA WRRF has adopted a Local Limit for PFOS of 65 ppt (Daily Maximum).[115]

GLWA WRRF conducted PFAS sampling of the influent from these industrial users as part of its Pollutant Minimization and Source Evaluation Program.[116] Based on its sampling, GLWA WRRF classified 48 of these facilities as "Significant Sources" and five as "Potential Sources" of PFOS and/or PFOA.[117]

There are likely additional unpermitted industrial dischargers contributing PFAS to the WRRF given that EPA's PFAS Analytic Tools[118] identifies 217 facilities located within the City of Detroit that are "operat[ing] in sectors that have been identified as possibly handling, using, or releasing PFAS chemicals," including:

- Airports
- Cement Mfg.
- Chemical Mfg.
- Cleaning Product Mfg.
- Consumer Products
- Fire Training
- Glass Products
- Industrial Gas
- Metal Coating
- Metal Machinery Mfg.
- Oil and Gas
- Paints and Coatings
- Paper Mills and Products
- Petroleum
- Plastics and Resins
- Printing
- Waste Management

Michigan's Department of Environment, Great Lakes, and Energy (EGLE) conducted PFAS sampling of GLWA WRRF's influent and effluent from 2018 to 2020. The results showed significant concentrations of PFOA (6.4 ppt to 12 ppt) and PFOS (5.7 ppt to 30 ppt) in the facility's effluent, and equally high concentrations in the facility's influent, including PFOA concentrations ranging from 4.64 ppt to 9.10 ppt and PFOS concentrations ranging from 7.54 ppt to 15.60 ppt.[119] Further, as part of its Pollutant Minimization and Source Evaluation Program, GLWA WRRF collected quarterly samples of its discharges during 2023 and tested them for 28 PFAS chemicals. The results showed annual average concentrations of PFOA at 8.5 ppt (max. 11.5 ppt) and PFOS at 13.8 ppt (max. 26.5 ppt).[120] The testing also detected other PFAS chemicals in the facility's effluent, including:

- PFBA (max. 19 ppt)
- PFPeA (max. 13 ppt)
- PFHxA (max. 23 ppt)
- PFBS (max. 26 ppt)
- PFHpA (max. 4.6 ppt)
- 6:2 FTSA (max. 8.5 ppt)
- PFHxS (max. 8.2 ppt)[121]

For this project, Detroit Riverkeeper deployed PFASsive™ passive sampling devices upstream and downstream from one of the GLWA WRRF's outfalls (Outfall 050) and the Oakwood Combined Sewer Overflow Retention Basin channel from August 8, 2024 to September 8, 2024.[122] Both upstream and downstream sampling sites detected multiple types of PFAS. However, the concentrations of multiple types of PFAS increased significantly at the downstream site resulting in a total PFAS concentration increase of 49.49 ppt–an increase of 146.81%. For example, the concentration of PFOA increased from 3.8 ppt to 44 ppt (1,057.89%) and the concentration of PFHxS increased from 1.8 ppt to 16 ppt (788.89%). Other types of PFAS increased in downstream samples at levels ranging from 19.23% to 48.39%, including PFHxA which increased from 6.2 ppt to 9.2 ppt. These results are consistent with the findings of previous sampling and indicate that the GLWA WRRF is likely a significant source of PFAS in the Rouge River.

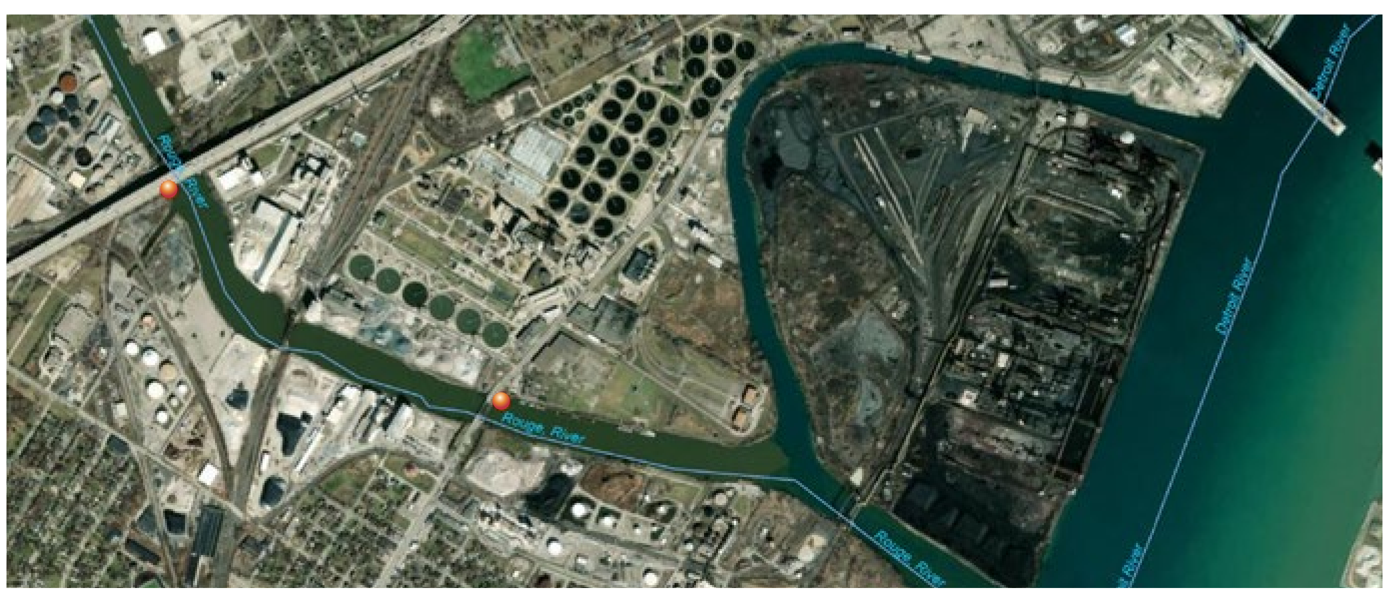
Downstream concentrations of PFAS demonstrate that the surface water as this location is likely unsafe for drinking without advanced treatment. For example, the concentration of PFOA at the downstream location was 44 ppt, which is 40 ppt greater than the MCL of 4 ppt, and the concentration of PFHxS was 16 ppt, which is 6 ppt greater than the MCL of 10 ppt. PFOA also exceeded Michigan's MCL (16 ppt) by 36 ppt.[123]

The concentrations of PFOA and PFOS in the downstream samples also greatly exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. In the downstream sample, PFOA exceeded the draft HHWQC (Water + Organism) of 0.0009 ppt by 43.9991 ppt, and PFOS exceeded the 0.06 ppt criteria by 3.04 ppt. There are no national or state Clean Water Act surface water quality criteria for the protection of human health that apply to the majority of PFAS that were detected at elevated levels, including PFHxS, PFDA, and PFHxA.

Other PFAS that do not have any federal or state regulatory standards exceeded EWG's health-based criteria, including PFDA and 6:2 FTS. PFOA, PFHxS, and PFOS also exceeded EWG's health-based criteria. *See Table 19 (above).*

This evaluation indicates that GLWA WRRF appears to be contributing a significant amount of PFAS to the Rouge River and that multiple industrial dischargers are likely contributing to the WRRF's discharge of PFAS to the river. This pollution will likely continue to create significant risks to human health until additional PFAS pretreatment limits are placed on industrial sources of PFAS discharging into the WRRF and more protective, mandatory permit limits are placed in the GLWA WRRF's NPDES permit, which will require installation of PFAS treatment technology and a plan to safely manage PFAS removed during the treatment process. Assessment of the two outlets contributions of PFAS to the Rouge River is also warranted and may result in the need for additional controls in those areas.

GLWA WRRF | Rouge River



PFAS Phase II Sampling Site

Table 19 – Rouge River Upstream and Downstream from GLWA WRRF

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)		MI MCL (ppt)	
	Upstream	Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFOA	3.80	44.00	40.20	1057.89%	4	40.00	0.0009	43.9991	0.09	43.910	8	36
PFHxS	1.80	16.00	14.20	788.89%	10	6.00			0.001	15.999	51	
PFDA	0.00	5.00	5.00	n/a					0.006	4.994		
PFHxA	6.20	9.20	3.00	48.39%					1000		400,000	
PFOS	2.60	3.10	0.50	19.23%	4		0.06	3.04	0.3	2.800	16	
PFHpA	1.60	1.60	0.00	0.00%					1000			
6:2 FTS	1.50	1.30	-0.20	-13.33%					1	0.300		
PFNA	0.61	0.00	-0.61	-100.00%	10				0.006		6	
FOSA	1.30	0.00	-1.30	-100.00%					0.3			
PFPeA	4.30	1.70	-2.60	-60.47%					1000			
PFBS	4.50	1.30	-3.20	-71.11%			400.00		2000		420	
PFBA	5.50	0.00	-5.50	-100.00%					1000			
Total PFAS	33.71	83.20	49.49	146.81%								

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Potomac Riverkeeper, Monocacy River, Maryland

Wastewater Treatment Plant and Biosolids Sites

The City of Frederick WWTP (Frederick WWTP) is a municipal wastewater treatment system that is owned and operated by the City of Frederick and serves a population of 73,000 residents.[124] In addition, the facility handles wastewater from two permitted Significant Industrial Users.[125] The Frederick WWTP discharges wastewater into the Lower Monocacy River at an average design flow of 8 MGD.[126] The Lower Monocacy Watershed covers 194,790 acres and is home to 7,626 residents. According to the EJScreen Community Report for this facility, Frederick WWTP is located in an area with two State Supplemental EJ Indexes greater than the 80th percentile within one mile of the facility, including wastewater discharges at 80 (State). According to the EPA EJScreen, of people living within one mile of Frederick WWTP, 37% are people of color and 15% are low income.[127]

The NPDES permit for Frederick WWTP does not include any limits on the amount of PFAS the facility discharges into the Monocacy River and there are no pretreatment limits to control PFAS discharges to the WWTP by industrial dischargers.[128] Neither of Frederick WWTPs permitted industrial users are included in EPA's PFAS Analytic Tools[129] as facilities "operat[ing] in sectors that have been identified as possibly handling, using, or releasing PFAS chemicals." There are likely additional unpermitted industrial dischargers contributing PFAS to the WWTP given that EPA's PFAS Analytic Tools identifies 40 facilities located within the City of Frederick that operate in related sectors, including:

- Airports
- Cement Mfg.
- Chemical Mfg.
- Cleaning Product Mfg.
- Electronics Industry
- Furniture and Carpet
- Metal Coating
- Metal Machinery Mfg.
- Mining and Refining
- National Defense
- Paints and Coatings
- Petroleum
- Printing
- Textiles and Leather
- Waste Management

For this project, Potomac Riverkeeper deployed PFASsive™ passive sampling devices immediately upstream and downstream from a Frederick WWTP outfall to the Monocacy River from August 13, 2024 to September 6, 2024. Both upstream and downstream sampling sites detected multiple types of PFAS. However, the concentrations of eight types of PFAS increased at the downstream site resulting in a total PFAS concentration increase of 33.64 ppt—an increase of 128.01%. For example, the concentration of PFPeA increased from 4.2 ppt to 22 ppt (423.81%), the concentration of PFHxA increased from 3.4 ppt to 13 ppt (282.35%), and the concentration of PFHxS increased from 1.1 ppt to 2.5 ppt (127.27%). Multiple other types of PFAS increased in downstream samples at levels ranging from 18.92% to 83.78%, including PFOA which increased from 3.7 ppt to 6.8 ppt. These results indicate that the Frederick WWTP's outfall is likely a significant source of PFAS in the Monocacy River.

City of Frederick WWTP | Monocacy River

● PFAS Phase II Sampling Site

Downstream concentrations of PFAS demonstrate that the surface water is unsafe at this location for drinking without advanced treatment. For example, the concentration of PFOA at the downstream location was 6.8 ppt, which is 2.8 ppt greater than the MCL of 4 ppt.

The concentrations of PFOA and PFOS in the downstream sample also exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. In the downstream sample, PFOA exceeded the draft HHWQC (Water + Organism) of 0.0009 ppt by 6.7991 ppt, and PFOS exceeded the 0.06 ppt criteria by 3.04 ppt. There are no national or state Clean Water Act surface water quality criteria for the protection of human health that apply to the majority of PFAS that were detected at elevated levels, including PFPeA, PFHxA, PFHxS, PFHpA, PFBA, and FOSA.

FOSA does not have any federal or state regulatory standards but exceeded EWG's health-based criteria. PFOA, PFHxS, and PFOS also significantly exceeded EWG's health-based criteria. *See Table 20 (below).*

Frederick WWTP contracts with Synagro Central, LLC to haul and land apply the facility's biosolids. Potomac Riverkeeper conducted PFAS sampling upstream and downstream from the biosolids land application site at the Baumgartner & Zack Property, one of Synagro's land application sites, which is located in the Monocacy River watershed that is approved for biosolids application from the Frederick WWTP and other WWTPs.[130]

Samples of the Monocacy River upstream and downstream from the biosolids land application site contained PFAS.[131] However, the concentrations of multiple types of PFAS increased at the downstream site resulting in a total PFAS concentration increase of 0.75 ppt—an increase of 2.75%. For example, the concentration of PFBS increased from 3.5 ppt to 3.9 ppt (11.43%), and PFNA increased

Table 20 | Monocacy River Upstream and Downstream from Frederick WWTP

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	Upstream	Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFPeA	4.20	22.00	17.80	423.81%					1000	
PFHxA	3.40	13.00	9.60	282.35%					1000	
PFOA	3.70	6.80	3.10	83.78%	4	2.80	0.0009	6.7991	0.09	6.710
PFBS	3.60	5.00	1.40	38.89%			400		2000	
PFHxS	1.10	2.50	1.40	127.27%	10				0.001	2.499
PFHpA	1.70	2.50	0.80	47.06%					1000	
PFBA	3.70	4.40	0.70	18.92%					1000	
FOSA	0.00	0.62	0.62	n/a					0.3	0.320
PFNA	0.68	0.00	-0.68	-100.00%	10				0.006	
PFOS	4.20	3.10	-1.10	-26.19%	4		0.06	3.0400	0.3	2.800
Total PFAS	26.28	59.92	33.64	128.01%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Table 21 | Monocacy River Upstream and Downstream from Biosolids Land Application Fields

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)		MD DW (ppt)	
	Upstream	Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	5.9	6.2	0.30	5.08%					1000			
PFHxA	4.4	4.9	0.50	11.36%					1000			
PFHpA	2.0	2.2	0.20	10.00%					1000			
PFOA	4.6	3.7	-0.90	-19.57%	4		0.0009	3.6991	0.09	3.61		
PFNA	0.00	0.77	0.77	n/a	10				0.006	0.764		
PFBS	3.5	3.9	0.40	11.43%			400		2000			
PFHxS	0.87	0.85	-0.02	-2.30%	10				0.001	0.849	140	
PFOS	6.0	5.5	-0.50	-8.33%	4	1.50	0.06	5.44	0.3	5.20		
Total PFAS	27.27	28.02	0.75	2.75%								

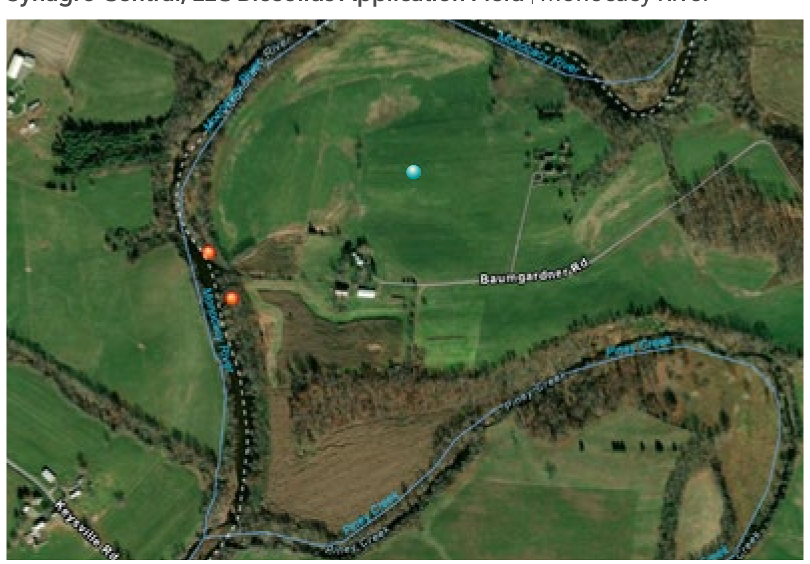
Non-detect recorded as 0 Downstream Increase Exceed criteria levels

from a non-detect to 0.77 ppt. Other types of PFAS increased in downstream samples at levels ranging from 5.08% to 11.36%.

The concentration of PFOS at the downstream location was 5.5 ppt, which is 1.5 ppt greater than the MCL of 4 ppt, rendering the surface water at this location unsafe for drinking without advanced treatment. PFOA and PFOS concentrations also exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. PFOA exceeded the draft HHWQC (Water + Organism) of 0.0009 ppt by 3.6991 ppt, and PFOS exceeded the draft HHWQC (Water + Organism) of 0.06 ppt by 5.44 ppt. PFOA, PFNA, PFHxS, and PFOS also exceeded the EWG health-based criteria. *See Table 21 (above).*

This evaluation indicates that Frederick WWTP is contributing PFAS to the Monocacy River and that multiple industrial dischargers to the WWTP are likely contributing to the discharge of PFAS to the river. This pollution will likely continue to create significant risks to human health until PFAS pretreatment limits are placed on industrial sources of PFAS discharging into the WWTP and a PFAS limit is placed in the Frederick WWTP's NPDES permit, which will require installation of PFAS treatment technology and a plan to safely manage PFAS removed during the treatment process.

Synagro Central, LLC Biosolids Application Field | Monocacy River



Biosolids Application Field

Tualatin Riverkeepers, Tualatin River, Oregon

Wastewater Treatment Plant Site

The Tualatin River Watershed spans 712 square miles and is home to over 600,000 Oregon residents. The Tualatin River flows approximately 83 miles from the Coast Mountain Range to the Willamette River. Fed by more than 900 miles of tributary streams, the river serves as a drinking water source for 400,000 people. The Rock Creek WRRF, which discharges into the Tualatin River, is a municipal wastewater treatment system that is owned and operated by Clean Water Services (CWS) and serves a population of approximately 326,488 residents.[132] In addition, the facility handles wastewater from numerous industrial dischargers, including five permitted Significant Industrial Users (SIUs) and 15 permitted Categorical Industrial Users (CIUs).

Clean Water Services also owns and operates three other water resource recovery facilities that receive discharges from an additional seven SIUs and 12 CIUs. Rock Creek WRRF "is designed to treat an average dry season flow of 52.7 MGD (projected for 2025 conditions and with no discharge from the Hillsboro and Forest Grove WRRFs) and a daily maximum wet weather flow of 126 MGD."[133] According to ECHO, Rock Creek WRRF is located in an area with 11 State Supplemental EJ Indexes and 11 Federal Supplemental EJ Indexes greater than the 80th percentile within one mile of the facility, including wastewater discharges at 99 (State).[134] According to the EPA EJScreen, of people living within one mile of Rock Creek WRRF, 45% are people of color and 17% are low income.[135]

Clean Water Services' 2022 Annual Report states that CWS monitors for PFAS at its STPs.[136] However, its NPDES permit[137] does not include any limits on the amount of PFAS the Rock Creek WRRF discharges into the Tualatin River, and there are no pretreatment limits to control PFAS discharges to the facility by industrial dischargers. Of Clean Water Services' 39 permitted industrial users, EPA's PFAS Analytic Tools[138] lists the following 11 as facilities "operat[ing] in sectors that have been identified as possibly handling, using, or releasing PFAS chemicals":

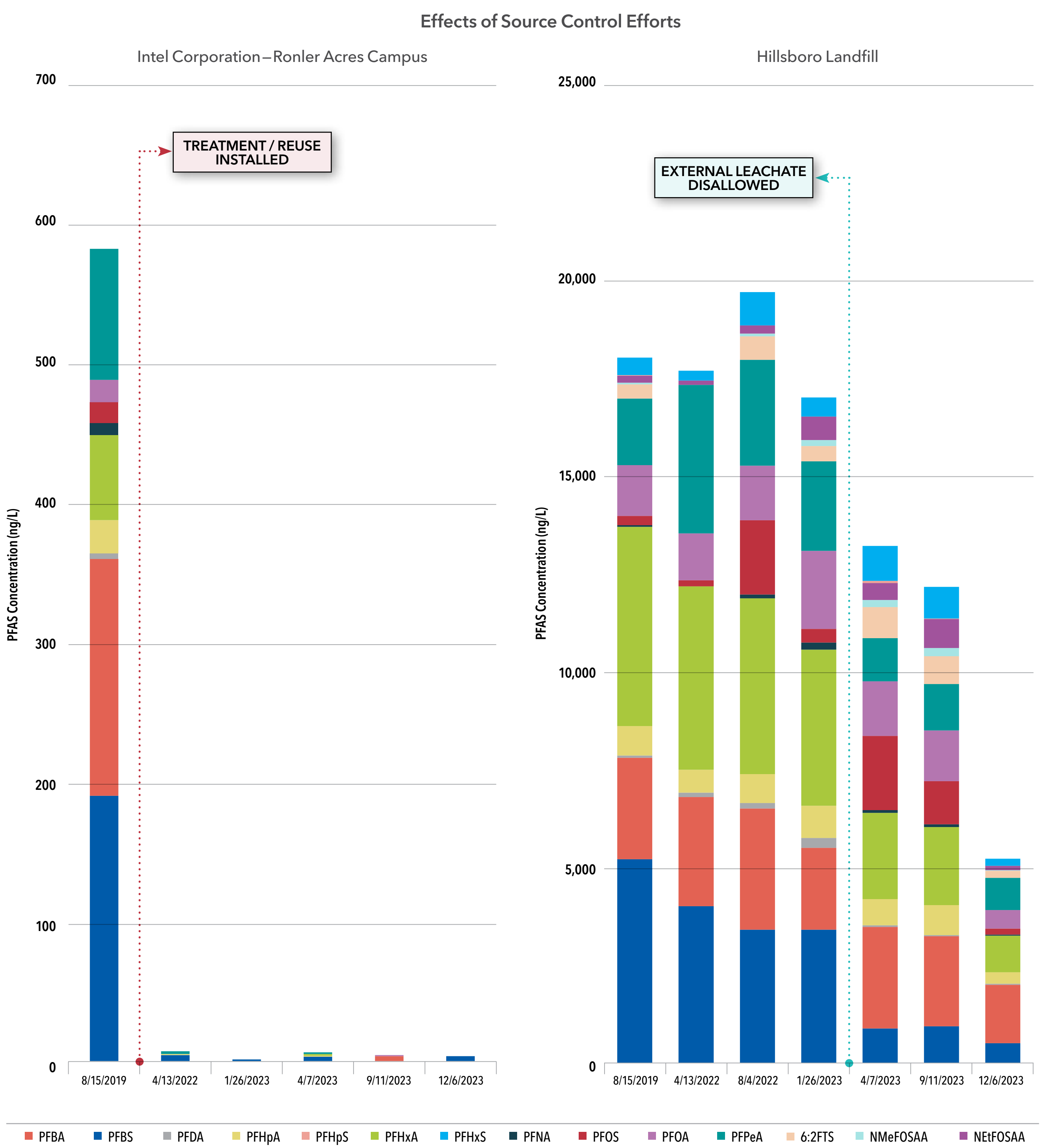
- Linde Inc. (Industrial Gas)
- TOK America (Chemical Mfg.)
- Analog Devices (formerly Maxim Integrated Products) (Electronics Industry)
- BASF Corporation (Chemical Mfg.)
- Hillsboro Landfill, Inc. (Waste Management)
- Intel Corporation – Ronler Acres Campus (Electronics Industry)
- Jireh Semiconductor, Inc. (Electronics Industry)
- KoMiCo Hillsboro, LLC (Metal Coating)
- Qorvo U.S. Inc. (Electronics Industry)
- QuantumClean (Metal Coating)
- Sumitomo Electric Semiconductor Materials, Inc. (Electronics Industry

There are likely additional unpermitted industrial dischargers contributing PFAS to the Rock Creek WRRF given that EPA's PFAS Analytic Tools identifies 51 facilities located within the City of Hillsboro that operate in related sectors, including:

- Airports
- Chemical Mfg.
- Electronics Industry
- Industrial Gas
- Metal Coating
- Metal Machinery Mfg.
- Plastics and Resins
- Printing
- Waste Management

Of the 20 permitted industrial users discharging wastewater specifically to Rock Creek WRRF, Clean Water Services has identified Intel Corporation – Ronler Acres Campus and Hillsboro Landfill as being the major industrial sources of PFAS to Rock Creek WRRF.[139] The majority of Intel Corporation's contribution appears to have significantly decreased after 2019, while Hillsboro Landfill continues to contribute significant concentrations of multiple types of PFAS from landfill leachate to Rock Creek WRRF.

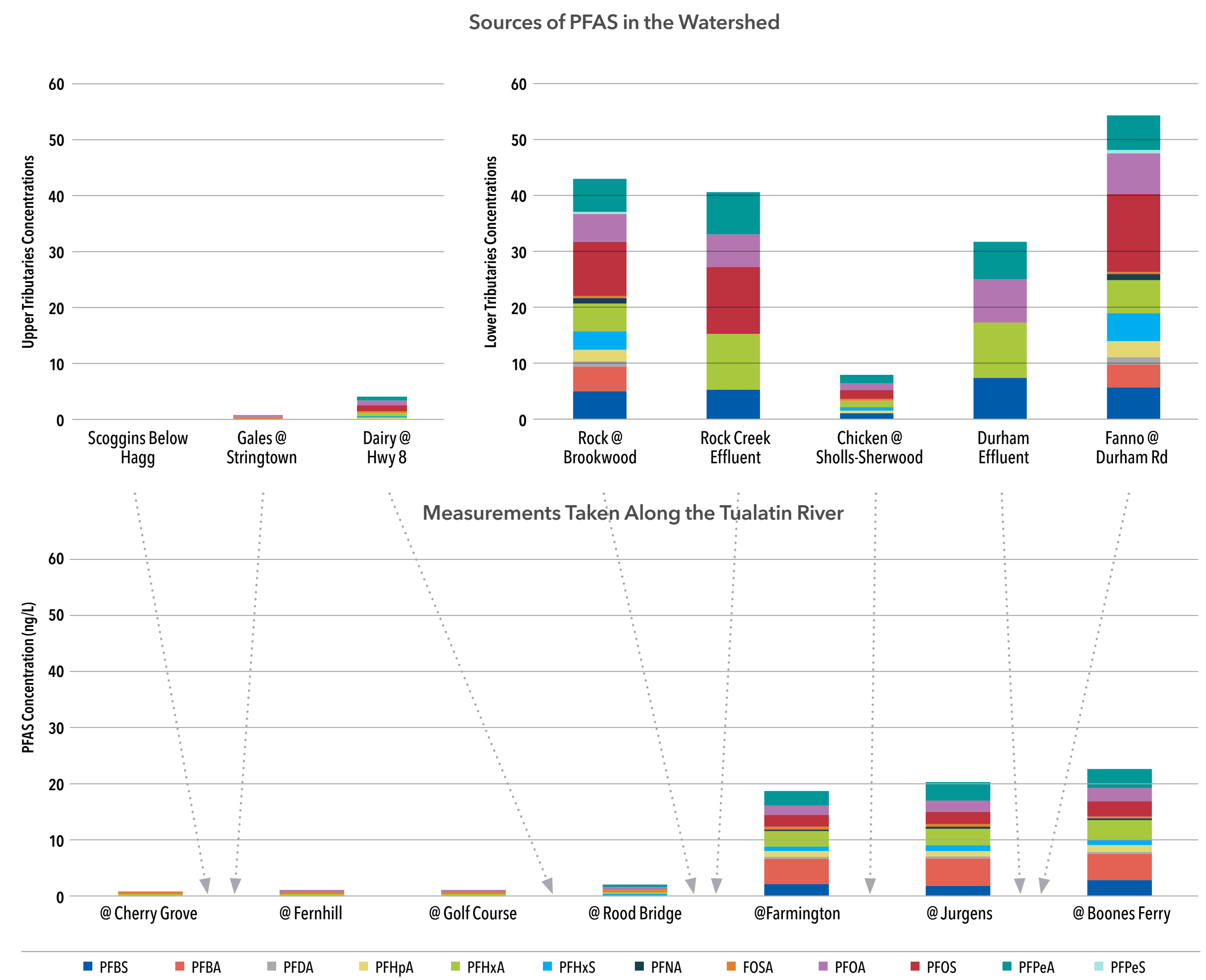
Figure 18 | Clean Water Services Advisory Commission 2024 Meeting[140]



Other than these two facilities, it is unclear how many of EPA's other listed facilities discharge into Rock Creek WRRF, rather than one of CWS' other three facilities. However, according to Clean Water Services' NPDES permit renewal application, Rock Creek WRRF may receive and treat flows from Hillsboro and Forest Grove depending on the season and whether the flows exceed the facilities' capacities.[141] Thus, Rock Creek is likely receiving, either directly or indirectly, discharges from at least some of these industrial users operating in PFAS-related sectors.

Clean Water Services has identified Rock Creek WRRF's summer discharges as a dominant source of PFAS pollution in the Tualatin River.[142] In particular, Clean Water Services has reported that Rock Creek WRRF's effluent contributes PFBS, PFHxA, PFOS, PFOA, and PFPeA to the river.

Figure 19 | Clean Water Services Advisory Commission 2024 Meeting[143]



For this project, Tualatin Riverkeepers deployed PFASsive™ passive sampling devices upstream and downstream from two Rock Creek WRRF outfalls from August 9, 2024 to September 19, 2024. The downstream sampling site detected multiple types of PFAS. However, the upstream sample only showed trace levels of PFOS at 0.97 ppt. The concentrations of multiple types of PFAS increased significantly at the downstream site resulting in a total PFAS concentration increase of 29.05 ppt—an increase of 2,994.85%. For example, the concentration of PFHxA increased from a non-detect to 7.1 ppt, the concentration of PFBA increased from a non-detect to 6.2 ppt, and the concentration of PFOS increased from 0.97 ppt to 2.5 ppt (157.73%). These results are consistent with the findings of previous sampling and indicate that the Rock Creek WRRF's outfall is likely a significant source of PFAS in the Tualatin River.

Rock Creek WRRF | Tualatin River

PFAS Phase II Sampling Site

The concentrations of PFOA and PFOS in the downstream samples greatly exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. In the downstream sample, PFOA exceeded the draft HHWQC (Water + Organism) of 0.0009 ppt by 3.2991 ppt, and PFOS exceeded the 0.06 ppt criteria by 2.44 ppt. There are no national or state Clean Water Act surface water quality criteria for the protection of human health that apply to the majority of PFAS that were detected at elevated levels, including PFHxA, PFBA, PFPeA, PFHpA, PFHxS, and PFNA. Additionally, PFOA, PFOS, PFNA and PFHxS exceeded EWG's health guidelines. *See Table 22 (below).*

This evaluation indicates that Rock Creek WRRF is contributing PFAS to the Tualatin River and that multiple industrial dischargers are likely contributing to the WRRF's discharge of PFAS to the river. This pollution will likely continue to create significant risks to human health until PFAS pretreatment limits are placed on industrial sources of PFAS discharging into the STP and a PFAS limit is placed in the Rock Creek WRRF's NPDES permit, which will require installation of PFAS treatment technology and a plan to safely manage PFAS removed during the treatment process.

Table 22 | Tualatin River Upstream and Downstream from Rock Creek WRRF

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	Upstream	Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFHxA	0.00	7.10	7.10	N/A					1000	
PFBA	0.00	6.20	6.20	N/A					1000	
PFPeA	0.00	4.40	4.40	N/A					1000	
PFBS	0.00	3.50	3.50	N/A			400		2000	
PFOA	0.00	3.30	3.30	N/A	4		0.0009	3.2991	0.09	3.210
PFHpA	0.00	1.70	1.70	N/A					1000	
PFOS	0.97	2.50	1.53	157.73%	4		0.06	2.4400	0.3	2.200
PFHxS	0.00	0.73	0.73	N/A	10				0.001	0.729
PFNA	0.00	0.59	0.59	N/A	10				0.006	0.584
Total PFAS	0.97	30.02	29.05	2994.85%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Inland Empire Waterkeeper, Santa Ana River, California
Wastewater Treatment Plant Site

The Riverside RWQCP is a municipal wastewater treatment system that is owned and operated by the City of Riverside's Department of Public Works and serves a population of more than 300,000.[144] In addition, the facility handles wastewater from numerous industrial dischargers, including 10 permitted Class I, Significant Industrial Users and two permitted Categorical Industrial Users. Riverside RWQCP discharges wastewater into the Santa Ana River at an average design flow of 46 MGD. The Santa Ana River Watershed covers 2,630 square miles across San Bernardino, Riverside, Orange, and Los Angeles Counties. According to ECHO, Riverside RWQCP is located in an area with 11 State Supplemental EJ Indexes and 13 Federal Supplement EJ Indexes greater than the 80th percentile within one mile of the facility, including wastewater discharges at 97 (Federal).[145] According to the EPA EJScreen, of people living within one mile of Riverside RWQCP, 80% are people of color and 34% are low income.[146]

The NPDES permit[147] for Riverside RWQCP does not include any limits on the amount of PFAS the facility discharges into the Santa Ana River and there are no pretreatment limits to control PFAS discharges to the RWQCP by industrial dischargers. Of the 12 permitted industrial users discharging wastewater to Riverside RWQCP, EPA's PFAS Analytic Tools[148] lists one facility as "operat[ing] in sectors that have been identified as possibly handling, using, or releasing PFAS chemicals": Von Zabern Surgical (Waste Management). There are likely additional unpermitted industrial dischargers contributing PFAS to the RWQCP given that EPA's PFAS Analytic Tools identifies 61 active facilities located within the City of Riverside that operate in PFAS-related sectors, including:

- Airports
- Cement Mfg.
- Chemical Mfg.
- Cleaning Product Mfg.
- Electronics
- Fire Protection
- Industrial Gas
- Metal Coating
- Metal Machinery Mfg.
- Mining and Refining
- National Defense
- Paints and coatings
- Petroleum
- Plastics and Resins
- Printing
- Textiles and Leather
- Waste Management

Based on 2021 sampling data collected by Riverside RWQCP, the facility's influent,[149] effluent,[150] and biosolids[151] contain significant concentrations of PFAS. The PFAS detected at the highest concentrations in the facility's influent, effluent, and biosolids were PFPeS (46 ppt), PFPeA (63 ppt), and 5:3 FTCA (140 ug/kg), respectively.

For this project, Inland Empire Waterkeeper conducted two rounds of sampling. It first deployed PFASsive™ passive sampling devices immediately downstream from a Riverside RWQCP's outfall to the Santa Ana River from

Riverside RWQCP | Santa Ana River

PFAS Phase II Sampling Site

August 14, 2024 to September 11, 2024. Two months later, Inland Empire Waterkeeper conducted its second round of sampling by deploying sampling devices downstream as well as upstream of a facility outfall to the Santa Ana River from November 11, 2024 to December 18, 2024. Both upstream and downstream sampling sites detected multiple types of PFAS.[152] However, the sampling devices deployed in November detected two PFAS that increased in concentration significantly at the downstream site resulting in a total PFAS concentration increase of 27.43 ppt—an increase of 30.58%. Specifically, the concentration of PFHxA increased from 11 ppt to 27 ppt (145.45%) and the concentration of PFPeA increased from 12 ppt to 43 ppt (258.33%).

Downstream concentrations of PFAS demonstrate that the surface water at this location is unsafe for drinking without advanced treatment. For example, the concentration of PFOA at the downstream location in November and August was 10 ppt and 13 ppt, respectively, which are 6 ppt and 9 ppt greater than the MCL, and the concentration of PFOS was 6.8 ppt and 12 ppt, respectively, which are 2.8 ppt and 8 ppt greater than the MCL.

The concentrations of PFOA and PFOS in the downstream samples also greatly exceeded the draft HHWQC, indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. In the November downstream sample, PFOA exceeded the draft HHWQC (Water + Organism) of 0.0009 ppt by 9.9991 ppt, and PFOS exceeded the 0.06 ppt criteria by 6.74 ppt. In the August downstream sample, PFOA exceeded the draft HHWQC (Water + Organism) by 12.9991 ppt, and PFOS exceeded the criteria by 11.94 ppt. There are no national or state Clean Water Act surface water quality criteria for the protection of human health that apply to certain PFAS that were detected at elevated levels, including PFPeA and PFHxA.

Additionally, PFOA and PFOS exceeded California's Public Health Goal of 0.007 ppt (PFOA) and 1 ppt (PFOS).[153] The November downstream sample detected PFOA and PFOS concentrations that exceeded the Public Health Goal by 9.993 ppt and 5.8 ppt, respectively, and the August downstream sample detected PFOA and PFOS concentrations that exceeded the Public Health Goal by 12.993 ppt and 11 ppt, respectively. Further, both the November and August downstream samples exceeded California's Notification Level of 3 ppt for PFHxS by 4.7 ppt.[154] Finally, numerous PFAS significantly exceeded EWG's health-based criteria, including PFDA (Aug.), PFPeS (Nov. and Aug.), and PFMBA (Aug.). PFOA (Nov. and Aug.), PFOS (Nov. and Aug.), PFNA (Nov. and Aug.) and PFHxS (Nov. and Aug.) also exceeded EWG's health-based criteria. *See Table 23 (p. 71).*

This evaluation indicates that Riverside RWQCP is contributing PFAS to the Santa Ana River and that multiple industrial dischargers to the RWQCP are likely contributing to the RWQCP's discharge of PFAS to the river. This pollution will likely continue to create significant risks to human health until PFAS pretreatment limits are placed on industrial sources of PFAS discharging into the RWQCP and a PFAS limit is placed in the Riverside RWQCP's NPDES permit, which will require installation of PFAS treatment technology and a plan to safely manage PFAS removed during the treatment process.

Table 23 | Santa Ana River Upstream and Downstream from Riverside RWQCP

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)		CA Public Health Goal (ppt)		CA Notification Level (ppt)	
	Upstream	Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
November														
PFPeA	12.00	43.00	31.00	258.33%										
PFHxA	11.00	27.00	16.00	145.45%					1000					
PFDA	0.00	0.00	0.00	0.00%					0.006					
PFMBA	0.00	0.00	0.00	0.00%					1					
PFNA	1.00	0.73	-0.27	-27.00%	10				0.006	0.724				
PFHpA	3.50	2.70	-0.80	-22.86%					1000					
PFOA	11.00	10.00	-1.00	-9.09%	4	6.00	0.0009	9.9991	0.09	9.910	0.007	9.993		
PFPeS	2.90	1.50	-1.40	-48.28%					1	0.500				
PFBA	13.00	11.00	-2.00	-15.38%					1000					
PFBS	9.30	6.70	-2.60	-27.96%			400		2000				500	
PFOS	11.00	6.80	-4.20	-38.18%	4	2.80	0.06	6.7400	0.3	6.500	1	5.800		
PFHxS	15.00	7.70	-7.30	-48.67%	10				0.001	7.699			3	4.70
Total PFAS	89.70	117.13	27.43	30.58%										
August (no upstream sampling)														
PFPeA	n/a	24.00	n/a	n/a					1000					
PFHxA	n/a	20.00	n/a	n/a					1000					
PFDA	n/a	2.20	n/a	n/a					0.006	2.194				
PFMBA	n/a	6.10	n/a	n/a					1	5.100				
PFNA	n/a	2.10	n/a	n/a	10				0.006	2.094				
PFHpA	n/a	3.60	n/a	n/a					1000					
PFOA	n/a	13.00	n/a	n/a	4	9	0.0009	12.9991	0.09	12.910	0.007	12.993		
PFPeS	n/a	1.20	n/a	n/a					1	0.200				
PFBA	n/a	12.00	n/a	n/a					1000					
PFBS	n/a	21.00	n/a	n/a			400		2000				500	
PFOS	n/a	12.00	n/a	n/a	4	8	0.06	11.9400	0.3	11.700	1	11.000		
PFHxS	n/a	7.70	n/a	n/a	10				0.001	7.699			3	4.7
Total PFAS	–	124.90	–	–										

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Milwaukee Riverkeeper, Root River and Spring Creek, Wisconsin

Wastewater Treatment Plant and Biosolids Sites

The Waukesha WWTP is a municipal wastewater treatment system that is owned and operated by the City of Waukesha that serves a population of 73,000 people.[155] In addition, the facility handles wastewater from 30 permitted industrial dischargers, including six Significant Industrial Users and 18 Categorical Industrial Users. Waukesha WWTP's permit was issued in 2019, at that time, Waukesha WWTP was discharging solely to the Fox River at an annual average design flow of 14 MGD. The permit, however, incorporates Waukesha WWTP's plans to start discharging most of its effluent to the Root River sometime "[d]uring the 5-year permit term."[156] This new discharge is based on approval of the first proposed Great Lakes diversion (for a community in a straddling county) under the Great Lakes Compact. In 2023, the upgrades necessary to transfer the majority of its discharges to the Root River were completed.[157] According to the permit, these discharges are allowed an annual average design flow of 9.3 MGD.

The Root River Watershed covers 198 square miles across parts of Waukesha, Milwaukee, and Racine counties in Wisconsin. It includes 117 miles of rivers and streams, including the Root River, which originates in southern Milwaukee County, and flows southeast into Lake Michigan. According to ECHO, Waukesha WWTP is located in an area with 13 State Supplemental EJ Indexes and 10 Federal Supplemental EJ Indexes greater than the 80th percentile within one mile of the facility, including wastewater discharges at 98 (State).[158] According to the EPA EJScreen, of people living within one mile of Waukesha WWTP, 28% are people of color and 28% are low income.[159]

The NPDES permit[160] for Waukesha WWTP does not include any limits on the amount of PFAS the facility discharges into the Root River and there are no pretreatment limits to control PFAS discharges to the WWTP by industrial dischargers. Of the 30 permitted industrial users discharging wastewater to Waukesha WWTP, EPA's PFAS Analytic Tools[161] lists the following five as facilities "operat[ing] in sectors that have been identified as possibly handling, using, or releasing PFAS chemicals": Gascoigne Co. (Metal Coating), GE Medical Systems, LLC (Electronics Industry), H.O. Bostrom Co. (Metal Coating), Profile Finishing Systems, LLC (Metal Coating), and Waukesha Memorial Hospital Inc. (Airports). There are likely additional unpermitted industrial dischargers contributing PFAS to the WWTP given that EPA's PFAS Analytic Tools identifies 40 facilities located within the City of Waukesha that operate in related sectors, including:

- Airports
- Chemical Mfg.
- Clean Product Mfg.
- Electronics Industry
- Industrial Gas
- Metal Coating
- Metal Machinery Mfg.
- Paints and Coatings
- Printing
- Textiles and Leather
- Waste Management

For this project, Milwaukee Riverkeeper deployed PFASsive™ passive sampling devices and duplicate devices immediately upstream and downstream from the Waukesha WWTP's outfall to the Root River from August 14, 2024 to September 18, 2024. Both upstream and downstream sampling sites detected multiple types of PFAS. However, the concentrations of nine types of PFAS increased at the downstream site, in both the primary and duplicate samples, resulting in a total PFAS concentration increase of 25.76 ppt—an increase of 90.26%—in the primary downstream sample, and 25.63 ppt (91.21% increase) in the duplicate downstream sample.

For example, in the primary and duplicate downstream samples, the concentration of PFPeA increased from 5.7 ppt to 18 ppt (215.79%) and 5.6 ppt to 18 ppt (221.43%), respectively. The concentration of PFOA increased in the primary and duplicate downstream samples from 4.2 ppt to 8 ppt (90.48%) and 3.9 ppt to 6.4 ppt (64.10%), respectively. Multiple other types of PFAS increased in downstream samples at levels ranging from 25% to 74.07% in the primary samples and 10.53% to 100% in the duplicate samples. These results indicate that the Waukesha WWTP's outfall is likely a significant source of PFAS in the Root River.

Waukesha WWTP Outfall | Root River

PFAS Phase II Sampling Site

Downstream concentrations of PFAS demonstrate that the surface water at this location is unsafe for drinking without advanced treatment. For example, the concentration of PFOA at the primary downstream location was 8 ppt, which is 4 ppt greater than the MCL, and the concentration of PFOS was 4.4 ppt, which is 0.4 ppt greater than the MCL.

The concentrations of PFOA and PFOS in the downstream samples also exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. In the primary downstream sample, PFOA exceeded the draft HHWQC (Water + Organism) Human Health Criteria of 0.0009 ppt by 7.9991 ppt, and PFOS exceeded the 0.06 ppt criteria by 4.34 ppt. There are no national or state Clean Water Act surface water quality criteria for the protection of human health that apply to certain PFAS that were detected at elevated levels, including PFPeA, PFHxA, PFBA, PFHpA, PFHxS, and PFNA.

Additionally, PFDA (duplicate sample) does not have any federal or state regulatory standards but exceeded EWG's health-based criteria. PFOA, PFOS, PFNA and PFHxS (primary sample) also exceeded EWG's health-based criteria. *See Table 24 (below).*

In addition to directly discharging wastewater into the Root River, Waukesha WWTP is permitted[162] to operate a Land Application Program to land apply its wastewater treatment biosolids. In its 2017 permit application,[163] Waukesha WWTP estimated that it would generate and

Table 24 | Root River Upstream and Downstream from Waukesha WWTP

Analyte	Sample (ppt)				Duplicate Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	Upstream	Downstream	Change	% Change	Upstream	Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFPeA	5.70	18.00	12.30	215.79%	5.60	18.00	12.40	221.43%					1000	
PFOA	4.20	8.00	3.80	90.48%	3.90	6.40	2.50	64.10%	4	4.00	0.0009	7.9991	0.09	7.910
PFHxA	4.50	7.60	3.10	68.89%	4.70	7.10	2.40	51.06%					1000	
PFBS	2.70	4.70	2.00	74.07%	2.80	4.80	2.00	71.43%			400		2000	
PFOS	2.70	4.40	1.70	62.96%	2.50	5.00	2.50	100.00%	4	0.40	0.06	4.3400	0.3	4.100
PFBA	5.20	6.50	1.30	25.00%	5.70	6.30	0.60	10.53%					1000	
PFHpA	1.30	1.90	0.60	46.15%	1.40	1.90	0.50	35.71%					1000	
PFHxS	1.60	2.10	0.50	31.25%	1.50	2.10	0.60	40.00%	10				0.001	2.099
PFNA	0.64	1.10	0.46	71.88%	0.00	1.30	1.30	n/a	10				0.006	1.094
PFDA	0.00	0.00	0.00	0.00%	0.00	0.83	0.83	n/a					0.006	0.824
Total PFAS	28.54	54.30	25.76	90.26%	28.10	53.73	25.63	91.21%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Table 25 | Spring Creek Upstream and Downstream from Biosolids Land Application Site

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)		WI MCL (ppt)		WI SW Quality–DW (ppt)		WI SW Quality–All Waters (ppt)	
	Upstream	Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	1.10	0.00	-1.10	-100.00%					1000							
PFPeA	0.00	0.00	0.00	0.00%					1000							
PFHxA	0.00	0.00	0.00	0.00%					1000							
PFHpA	0.00	0.00	0.00	0.00%					1000							
PFOA	0.00	0.00	0.00	0.00%	4		0.0009		0.09		70		20			
PFNA	0.00	0.00	0.00	0.00%	10				0.006							
PFDA	0.00	0.00	0.00	0.00%					0.006							
PFBS	0.00	0.00	0.00	0.00%			400		2000							
PFPeS	0.00	0.00	0.00	0.00%					1							
PFHxS	0.00	0.00	0.00	0.00%	10				0.001							
PFHpS	0.00	0.00	0.00	0.00%					0.001							
PFOS	0.00	0.00	0.00	0.00%	4		0.06		0.3		70				8	
FOSA	0.00	0.00	0.00	0.00%					0.3							
HFPO-DA (GenX)	0.00	0.00	0.00	0.00%					9							
Total PFAS	1.1	0	-1.1	-100.00%												

Non-detect recorded as 0

land apply a total of 1,352 dry tons of Class B, anaerobically digested biosolids annually.

Milwaukee Riverkeeper conducted PFAS sampling in Spring Creek upstream and downstream from multiple land application sites near East Troy, Wisconsin, in the Fox River watershed. In 2024, these fields received roughly 374 metric tons of Waukesha WWTP's biosolids. The only PFAS detected at the sampling sites was PFBA, and it was only detected upstream of the biosolids land application fields at a concentration of 1.1 ppt. The concentration of PFBA decreased to a non-detect—a 100% decrease—at the downstream site. *See Table 25 (above).*

This evaluation indicates that Waukesha WWTP is contributing PFAS to the Root River and that multiple industrial dischargers are likely contributing to the WWTP's discharge of PFAS to the river. This pollution will likely continue to create significant risks to human health until PFAS pretreatment limits are placed on industrial sources of PFAS discharging into the WWTP and a PFAS limit is placed in the Waukesha WWTP's NPDES permit, which will require installation of PFAS treatment technology and a plan to safely manage PFAS removed during the treatment process.

Spokane Riverkeeper, Spokane River and Dragoon Creek, Washington

Wastewater Treatment Plant and Biosolids Sites

The Spokane Riverside Park WRF is a municipal wastewater treatment system that is owned and operated by the City of Spokane that serves a population of approximately 255,000 residents.[164] In addition, the facility handles wastewater from numerous industrial dischargers, including six permitted Categorical Industrial Users and eight permitted Significant Industrial Users. Spokane Riverside Park WRF discharges wastewater into the Spokane River at a Maximum Month Average Design Flow of 68.1 MGD during the months of March to October, and 56.4 MGD from November to February.

The Spokane River flows 111 miles west from Lake Coeur d'Alene in Idaho into Washington State, where it empties into the Franklin D. Roosevelt Lake impoundment of the Columbia River. The Spokane Valley-Rathdrum Prairie aquifer, which sits below the watershed, is a primary source of drinking water. According to ECHO, Spokane Riverside Park WRF is located in an area with 10 State EJ Supplemental Indexes and eight Federal Supplemental Indexes greater than the 80th percentile within one mile of the facility, including wastewater discharges at 95 (State).[165] According to the EPA EJScreen, of people living within one mile of Spokane Riverside Park WRF, 14% are people of color and 20% are low income.[166]

The NPDES permit[167] for Spokane Riverside Park WRF does not include any limits on the amount of PFAS the facility discharges into the Spokane River and there are no pretreatment limits to control PFAS discharges to the WRF by industrial dischargers. Of the 14 permitted industrial users discharging wastewater to Spokane Riverside Park WRF, EPA's PFAS Analytic Tools[168] lists two as facilities "operat[ing] in sectors that have been identified as possibly handling, using, or releasing PFAS chemicals.": Spokane Metal Finishing (Metal Coating) and Fairchild Airforce Base (National Defense). The federal government has identified Fairchild Airforce Base (AFB) as one of the facilities that used aqueous film forming foam (AFFF) containing PFAS for firefighter training.[169] There are likely additional unpermitted industrial dischargers contributing PFAS to the WRF given that EPA's PFAS Analytic Tools identifies 100 facilities located within the City of Spokane that operate in related sectors, including:

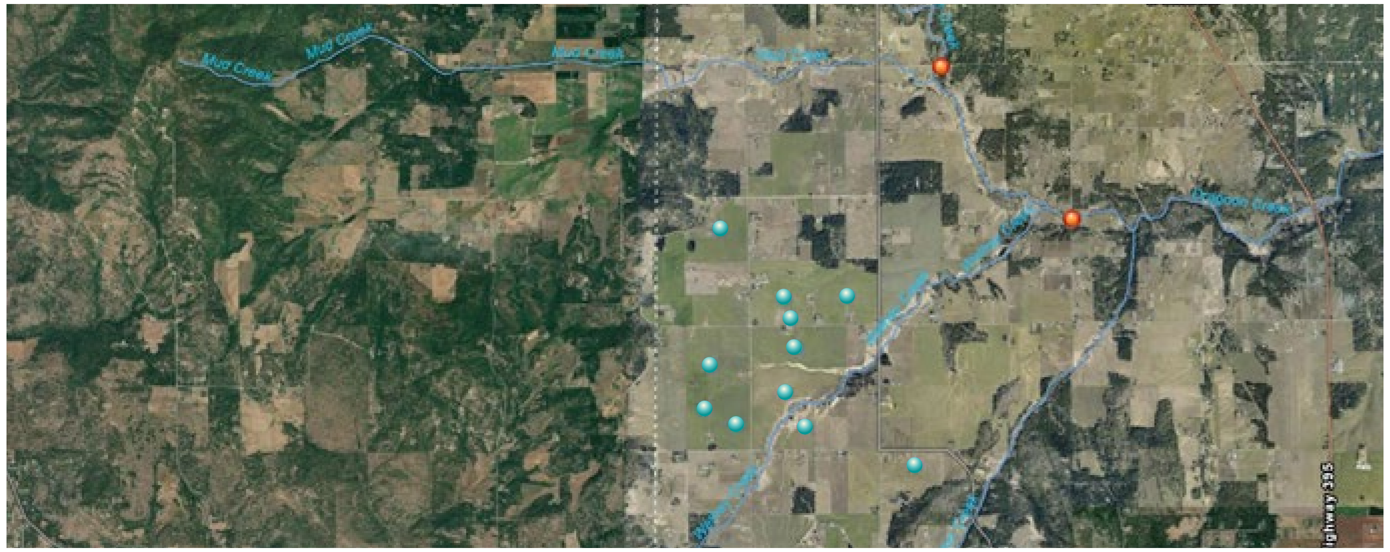
- Airports
- Chemical Mfg.
- Electronics Industry
- Fire Training
- Furniture and Carpet
- Industrial Gas
- Metal Coating
- Metal Machinery Mfg.
- Mining and Refining
- National Defense
- Paints and Coatings
- Paper Mills and Products
- Petroleum
- Plastics and Resins
- Printing
- Textiles and Leathers
- Waste Management

Washington Department of Ecology's 2016 sampling study of Spokane Riverside Park WRF's effluent revealed significant concentrations of PFAS. Specifically, the Department's study detected concentration levels of total Perfluoroalkyl acids of 91.8 ppt in the spring samples and 71.4 ppt in the fall samples.[170]

For this project, Spokane Riverkeeper deployed PFASsive™ passive sampling devices immediately upstream and downstream from Spokane Riverside Park WRF's outfall from August 7, 2024 to September 11, 2024. Samples of the Spokane River upstream and downstream from a Spokane Riverside Park WRF outfall contained multiple types of PFAS. However, the concentrations of four types of PFAS increased at the downstream site resulting in a total PFAS concentration increase of 4.76 ppt or 383.87%. For example, the concentration of PFHxA increased from 0.54 ppt to 2 ppt (270.37% increase).

Additional PFAS were also detected downstream at increased levels, including PFOA (1.1 ppt), PFOS (2.1 ppt), and PFHxS (0.8 ppt). PFOA and PFOS exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. PFOA, PFHxS, and PFOS also exceeded the EWG health-based criteria. *See Table 26 (p. 76).*

Spokane Riverside Park WRF Biosolids Fields | Dragoon Creek



● PFAS Phase II Sampling Site ● Biosolids Land Application Fields

Spokane Riverside Park WRF land applies biosolids at various locations in the Spokane River watershed. According to Spokane Riverside Park WRF's 2023 Biosolids Facility Report, the facility produced 7,168 dry tons of Class B biosolids, all of which were land-applied in-state at eight agricultural sites in amounts ranging from 1.69 tons/acre to 4.07 tons/acre. The total measured acreage of these sites was 2,613.[171]

For this project, Spokane Riverkeeper deployed PFASsive™ passive sampling devices immediately upstream and downstream from multiple Spokane Riverside Park WRF land application sites—Eichmeyer Fields 3 and 5, Ingwaldson Fields 1 and 2, and Eckhart Fields 17 and 18—all of which are located along Dragoon Creek. The devices were deployed on August 7, 2024, and retrieved on September 11, 2024. The downstream sampling site detected multiple types of PFAS. However, the upstream location only detected one type of PFAS, FOSA at 0.63 ppt.

At the downstream location, the concentrations of multiple types of PFAS increased significantly resulting in a total PFAS concentration increase of 32.26 ppt—an increase of 5,120.63%. For example, the concentration of PFPeA increased from a non-detect to 12 ppt, and the concentration of PFHxA increased from a non-detect to 7.4 ppt. These results indicate that the Spokane Riverside Park WRF's biosolids land application fields are likely a significant source of PFAS in Dragoon Creek, a tributary to the Little Spokane River.

Additionally, the concentration of PFOA in the downstream sample exceeded the draft HHWQC (Water + Organism), indicating the concentration exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. Specifically, in the downstream sample, PFOA exceeded the draft HHWQC (Water + Organism) of 0.0009 ppt by 1.4991 ppt. There are no national or state Clean Water Act surface water quality criteria for the protection of human health that apply to certain PFAS that were detected at elevated levels, including PFPeA, PFHxA, PFBS, PFBA, PFHpA, and PFHxS.

FOSA—a type of PFAS that does not have any federal or state regulatory standards—exceeded EWG's health-based criteria by 0.58 ppt. PFOA and PFHxS also exceeded EWG's health-based criteria. *See Table 27 (below).*

This evaluation indicates that Spokane Riverside Park WRF biosolids sites are likely contributing a significant amount of PFAS to Dragoon Creek and that multiple industrial dischargers are likely contributing to the WRF's discharge of PFAS to the waterway. This pollution will likely continue to create significant risks to human health until PFAS pretreatment limits are placed on industrial sources of PFAS discharging into the WRF and PFAS limits are placed in Spokane Riverside Park WRFF's NPDES permit, which will require installation of PFAS treatment technology, limits on biosolids land application, and a plan to safely manage PFAS removed during the treatment process.

Table 26 | Spokane River Upstream and Downstream from Spokane Riverside Park WRF

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)		WA DW Action Level (ppt)	
	Upstream	Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFHxA	0.54	2.00	1.46	270.37%					1000			
PFOA	0.00	1.10	1.10	n/a	4		0.0009	1.0991	0.09	1.01	10	
PFHxS	0.00	0.80	0.80	n/a	10				0.001	0.799	65	
PFOS	0.70	2.10	1.40	200.00%	4		0.06	2.04	0.3	1.80	15	
Total PFAS	1.24	6.00	4.76	383.87%								

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Table 27 | Dragoon Creek Upstream and Downstream from Biosolids Sites

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	Upstream	Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFPeA	0	12	12.00	n/a					1000	
PFHxA	0	7.4	7.40	n/a					1000	
PFBS	0	5.8	5.80	n/a			400		2000	
PFBA	0	3.1	3.10	n/a					1000	
PFHpA	0	1.5	1.50	n/a					1000	
PFOA	0	1.5	1.50	n/a	4		0.0009	1.4991	0.09	1.41
PFHxS	0	0.71	0.71	n/a	10				0.001	0.709
FOSA	0.63	0.88	0.25	39.68%					0.3	0.58
Total PFAS	0.63	32.89	32.26	5120.63%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Cape Fear Riverkeeper, Cape Fear and South Rivers, North Carolina

Wastewater Treatment Plant and Biosolids Sites

The Cross Creek WRF is a municipal wastewater treatment system that is owned and operated by the Fayetteville Public Works Commission and serves a population of approximately 100,500 residents.[172] In addition, the facility handles wastewater from numerous industrial dischargers, including eight permitted Significant Industrial Users, two of which are Categorical Industrial Users.[173] Cross Creek WRF discharges wastewater into the Cape Fear River at a monthly average design flow of 25 MGD.

The Cape Fear River Basin, the largest in North Carolina, spans approximately 9,164 square miles, or about 16.5% of the state's total land area. Nearly one-third of North Carolina's population resides in the basin. According to ECHO, Cross Creek WRF is located in an area with 12 State Supplemental EJ Indexes and 12 Federal Supplemental EJ Indexes greater than the 80th percentile within one mile of the facility, including wastewater discharges at 99 (State and Federal).[174] According to the EPA EJScreen, of people living within one mile of Cross Creek WRF, 89% are people of color, 77% are low income, and 9.78% of households are on public assistance.[175]

The NPDES permit[176] for Cross Creek WRF does not include any limits on the amount of PFAS the facility discharges into the Cape Fear River and no pretreatment limits to limit PFAS discharges to the WRF by industrial dischargers. Of the permitted industrial users discharging wastewater to Cross Creek WRF, EPA's PFAS Analytic Tools[177] lists the following three as facilities "operat[ing] in sectors that have been identified as possibly handling, using, or releasing PFAS chemicals":

- Hexion Inc. – Fayetteville Facility (Plastics and Resins)
- Goodyear Tire and Rubber Co. (Consumer Products)
- Cumberland County Landfill (Waste Management)

There are likely additional unpermitted industrial dischargers contributing PFAS to the WRF given that EPA's PFAS Analytic Tools identifies 31 facilities located within the City of Fayetteville that operate in PFAS-related sectors including:

- Airports
- Chemical Mfg.
- Consumer Products
- Industrial Gas
- Metal Coating
- National Defense
- Petroleum
- Plastics and Resins
- Waste Management

In 2019, DEQ sampled Cross Creek WRF's influent for PFAS. The sampling results showed the presence of 13 PFAS; five of which were detected at concentrations greater than 20 ppt: PFBA (max. 21.3 ppt), PFHxS (max. 20.4 ppt), PFHxA (max. 35.5 ppt), PFPeA (max. 30 ppt), and PFOS (max. 28.3 ppt).[178]

For this project, Cape Fear Riverkeeper deployed PFASsive™ passive sampling devices immediately upstream and downstream from Cross Creek WRF's outfall from September 5, 2024 to November 8, 2024. Samples of the Cape Fear River upstream and downstream from Cross Creek WRF were contaminated with ten types of PFAS, and nine types of PFAS were detected at increased levels at the downstream site.[179] PFAS were detected downstream at increased levels, including PFOA, PFBS, PFHxS, and PFOS. PFOA (8.3 ppt) and PFOS (13 ppt) exceeded the MCL, rendering the surface water unsafe for drinking without advanced treatment, and exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. PFOA, PFOS, PFNA, and PFHxS also exceeded the EWG health-based criteria. *See Table 28 (p. 79).*

In addition to directly discharging wastewater into the Cape Fear River, the Fayetteville Public Works Commission is permitted to operate a Residuals Land Application Program to land apply wastewater treatment Class B residuals at various locations in the Cape Fear and Lumber

Table 28 | Cape Fear River Upstream and Downstream from Fayetteville Cross Creek WRF

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	Upstream	Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	5.00	5.40	0.40	7.41%					1000	
PFPeA	7.30	8.60	1.30	15.12%					1000	
PFHxA	5.70	6.70	1.00	14.93%					1000	
PFHpA	3.50	3.70	0.20	5.41%					1000	
PFOA	8.10	8.30	0.20	2.41%	4	4.30	0.0009	8.2991	0.09	8.21
PFNA	1.10	1.10	0.00	0.00	10				0.006	1.094
PFBS	4.20	4.70	0.50	10.64%			400		2000	
PFPeS	0.93	0.94	0.01	1.06%					1	
PFHxS	5.10	5.30	0.20	3.77%	10				0.001	5.299
PFOS	11.00	13.00	2.00	15.38%	4	9.00	0.06	12.94	0.3	12.70
Total PFAS	51.93	57.74	5.81	10.06%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

River Basins.[180] According to its 2023 Annual Report, which includes annual land application data from Cross Creek and Rockfish Creek WWTPs, Fayetteville land-applied 3,651.02 dry tons of Class B residuals on 58 fields totalling 1,443.93 acres during 2023.[181] The permits for these facilities do not contain any monitoring or limits on the amount of PFAS that can be present in the land-applied residuals.

Fayetteville's 2023 Annual Report[182] also identifies the locations where the city land-applied these 3,651.02 dry tons of residuals—of which 1,940.35 dry tons were generated by Cross Creek WRF. Several of Fayetteville's sites with the greatest volumes of land application (exceeding three tons/acre) in 2023[183] are located directly adjacent to the South River, a tributary to the Cape Fear River, near Autryville, North Carolina. These fields are traversed by ditches that channel runoff, shallow groundwater, and any pollutants directly into the South River.

For this project, Cape Fear Riverkeeper deployed PFASsive™ passive sampling devices immediately upstream and downstream of Cross Creek WRF's land application sites along the South River. These fields received 672.66 tons of residuals from Cross Creek WRF in 2023 in amounts ranging from 1.10 tons/acre to 5.07 tons/acre. The devices were deployed on August 27, 2024. The downstream device was retrieved on November 8, 2024, and the upstream device was retrieved on January 10, 2025. Cape Fear Riverkeeper also deployed a duplicate sampling device downstream of the land application site from August 27, 2024 to November 8, 2024.

Both upstream and downstream sampling sites detected multiple types of PFAS. However, the concentrations of all detected PFAS increased at the downstream site resulting in a total PFAS concentration increase of 20.21 ppt (96.28%). For example, the concentration of PFBS increased from 2.7 ppt to 5.5 ppt (103.7%). Multiple other types of PFAS increased in downstream samples at levels ranging from 31.58% to 86.67%. These results indicate that the Cross Creek WRF's residuals land application fields in the South River watershed are likely a significant source of PFAS in the South River.

Downstream concentrations of PFAS demonstrate that the surface water at this location is unsafe for drinking without advanced treatment. For example, the concentration of PFOA at the downstream location was 5.8 ppt, which is 1.8 ppt greater than the MCL of 4 ppt, and the concentration of PFOS was 7.5 ppt, which is 3.5 ppt greater than the MCL of 4 ppt.

The concentrations of PFOA and PFOS in the downstream sample also exceeded the draft HHWQC (Water +

Fayetteville Cross Creek Biosolids Fields | South River

● PFAS Phase II Sampling Site ● Biosolids Land Application Fields

Organism), indicating that concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. In the downstream sample, PFOA exceeded the draft HHWQC (Water + Organism) of 0.0009 ppt by 5.7991 ppt, and PFOS exceeded the 0.06 ppt criteria by 7.44 ppt. There are no national or state Clean Water Act surface water quality criteria for the protection of human health that apply to certain PFAS that were detected at elevated levels, including PFPeA, PFBA, PFHxS, PFHpA, PFHxA, FOSA, PFNA, and HFPO-DA (Gen-X).

Additionally, FOSA—a type of PFAS that does not have any federal or state regulatory standards—exceeded EWG's health-based criteria by 0.56 ppt. PFOA, PFOS, PFNA, and PFHxS also exceeded EWG's health-based criteria. *See Table 29 (below).*

This evaluation indicates that Cross Creek WRF's land application sites are likely contributing a significant amount of PFAS to the South River and that multiple industrial dischargers are likely contributing to the WWTP's discharge of PFAS to the waterway. This pollution will likely continue to create significant risks to human health until PFAS pretreatment limits are placed on industrial sources of PFAS discharging into the WWTP and PFAS limits are placed in the Cross Creek WRF's NPDES permit, which will require installation of advanced treatment technology, limits on residuals land application, and a plan to safely manage PFAS removed during the treatment process.

Table 29 | South River Upstream and Downstream from Biosolids Site

Analyte	Sample (ppt)					MCL (ppt)		EPA (ppt)		EWG (ppt)	
	Upstream	Downstream	Downstream Duplicate	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFPeA	0	4.2	4.8	4.20	n/a					1000	
PFBA	3.9	6.7	6.2	2.80	71.79%					1000	
PFBS	2.7	5.5	5.1	2.80	103.70%			400		2000	
PFOA	3.3	5.8	5.8	2.50	75.76%	4	1.8	0.0009	5.7991	0.09	5.71
PFHxS	0	2.4	2.2	2.40	n/a	10				0.001	2.399
PFOS	5.7	7.5	6.7	1.80	31.58%	4	3.5	0.06	7.44	0.3	7.2
PFHpA	1.5	2.8	2.8	1.30	86.67%					1000	
PFHxA	2.2	3.1	3.2	0.90	40.91%					1000	
FOSA	0	0.86	0.62	0.86	n/a					0.3	0.56
PFNA	1	1.4	1.3	0.40	40.00%	10				0.006	1.394
HFPO-DA (GenX)	0.69	0.94	0.84	0.25	36.23%	10				9	
Total PFAS	20.99	41.2	39.56	20.21	96.28%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Cahaba Riverkeeper and Black Warrior Riverkeeper, Cahaba River and Cane Creek, Alabama

Wastewater Treatment Plant and Biosolids Sites

The Cahaba River WWTP is a municipal wastewater treatment system that is owned and operated by the Jefferson County Commission Environmental Services Department. This facility serves a population of 95,000 people[184] and discharges wastewater into the Cahaba River at an average design flow of 12 MGD.[185] According to ECHO, Cahaba River WWTP is located in an area with 10 State Supplemental EJ Indexes and nine Federal Supplement EJ Indexes greater than the state's 80th percentile within one mile of the facility.[186] According to the EPA EJScreen, of people living within one mile of Cahaba WRF, 65% are people of color and 34% are low income.[187]

The Jefferson County Environmental Services Department is authorized to receive discharges from numerous industrial dischargers pursuant to its Industrial Pretreatment Program, including 53 industrial facilities, of which 25 are permitted under the State Indirect Discharge (SID) program, and nine landfills.[188] Because Jefferson County Environmental Services Department's wastewater treatment and collection system consists of nine wastewater treatment plants, including Cahaba River WWTP, it is unclear whether the facility receives discharges from any of these industrial users and, if so, to what extent. Although Cahaba River WWTP's 2017 NPDES renewal application states that it is subject to an approved pretreatment program, the facility also states that it receives discharges from zero industrial users.[189]

The NPDES permit[190] for Cahaba River WWTP does not include any limits on the amount of PFAS the facility discharges into the Cahaba River, and there are no pretreatment limits to control PFAS discharges to the facility by industrial users. Of the 25 permitted industrial users discharging wastewater to the Jefferson County Environmental Services Department facilities, EPA's PFAS Analytic Tools[191] identifies the following 11 facilities as "operat[ing] in sectors that have been identified as possibly handling, using, or releasing PFAS chemicals":

- Amerex Corporation (Metal Coating and Chemical Mfg.)
- Chevron Bulk Terminal Birmingham (Petroleum)
- CRB (Plastics and Resins, and Textiles and Leather)
- Hanna Steel (Metal Coating)
- Kaiser Industries (Airports)
- Kent Corporation (Metal Machinery Mfg.)
- Max Coating (Metal Coating)
- Nutec Metal Finishing, LLC (Metal Coating)
- Precoat Metals (Metal Coating)
- Progressive Metal Finishers, Inc. (Metal Coating)
- Scholar Craft Products, Inc. (Metal Coating)

EPA also identifies these landfills (Waste Management) as handling, using, or releasing PFAS, including:

- Cedar Hill
- Big Sky Solid Waste Facility
- Eastern Area Landfill
- Green Mountain
- New Georgia Landfill
- Pine View Landfill
- Star Ridge
- Willow Ridge Landfill

In addition, 11 facilities (8 of which have separate NPDES permits) located in the Cities of Hoover, Irondale, and Vestavia Hills, areas serviced by Cahaba River WWTP, are also included on EPA's list as potential PFAS-discharging facilities including:

- TV Alabama (Airport)
- City of Hoover (Waste Management)
- Scholar Craft Products, Inc. (Metal Coating)
- United Chair Irondale Plant (Metal Coating)
- International Oil Corp. (Paints and Coatings)
- Creative Polymer Solutions, LLC (Plastics and Resins)
- Eastwood Mobile Home Village (Waste Management)
- EWTN WWTP (Waste Management)
- Irondale WWTF (Waste Management)
- Liberty Park WRRF (Waste Management)
- Cahaba River WRF (Waste Management), the facility sampled for purposes of this report

For this project, Cahaba Riverkeeper deployed PFASsive™ passive sampling devices immediately upstream and downstream from Cahaba River WWTP's outfall from August 22, 2024 to September 18, 2024. Samples taken upstream and downstream from Cahaba

Table 30 | Cahaba River Upstream and Downstream from Cahaba River WWTP

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	Upstream	Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	5.20	5.20	0.00	0.00					1000	
PFPeA	7.30	10.00	2.70	36.99%					1000	
PFHxA	5.40	6.40	1.00	18.52%					1000	
PFHpA	1.70	1.90	0.20	11.76%					1000	
PFOA	4.60	4.90	0.30	6.52%	4	0.90	0.0009	4.8991	0.09	4.81
PFNA	0.85	0.73	-0.12	0.14%	10				0.006	0.724
PFDA	0.52	0.00	-0.52	-100.00%					0.006	
PFBS	6.00	6.40	0.40	6.67%			400		2000	
PFHxS	1.30	1.50	0.20	15.38%	10				0.001	1.499
PFOS	5.20	4.50	-0.70	-13.46%	4	0.50	0.06	4.44	0.3	4.20
Total PFAS	38.07	41.53	3.46	9.09%						

Non-detect recorded as 0   Downstream Increase   Exceed criteria levels

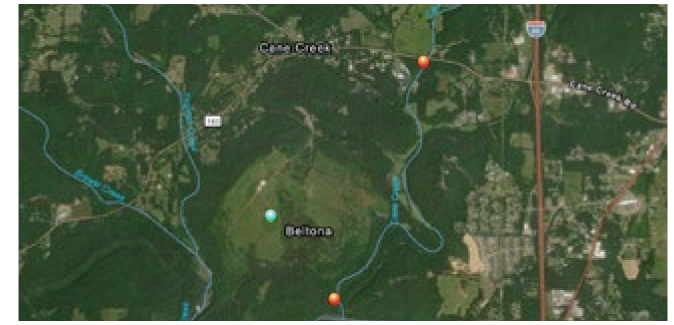
River WWTP outfalls were contaminated with multiple types of PFAS, and six types of PFAS were detected at increased concentrations at the downstream site.[192] PFPeA increased most significantly at the downstream site from 7.3 ppt to 10 ppt (36.99%). The total PFAS concentration increased by 3.46 ppt or 9.09%. At the downstream site, PFOA (4.9 ppt) exceeded the MCL, rendering the surface water unsafe for drinking water without advanced treatment. PFOA and PFOS also exceeded the draft HHWQC (Water + Organism) at the downstream site, indicating the concentration exceeded the level EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. Additionally, numerous PFAS significantly exceeded EWG's health-based criteria, including PFOA, PFNA, PFHxS, and PFOS. *See Table 30 (above).*

In 2024, Cahaba River WWTP generated 4,664 dry tons of biosolids. However, the facility has not produced biosolids for land application since October 2020.[193] Its current process for disposing of biosolids is to pump them, as waste activated biosolids, to the Al Seier Pump Station, where they are mixed with wastewater and sent to the Valley Creek WRF for full treatment. From Valley Creek,[194] the biosolids are authorized to be land-applied at a 241-acre mine reclamation site, called the Flat Top Land Application Site, as well as a 1,000-acre agricultural land application site, called the Beltona Land Reclamation Site. The Beltona Land Reclamation Site, which is located in the Cane Creek watershed (in Black Warrior Riverkeeper's watershed), is used to grow bermuda grass for erosion control.

For this project, Cahaba Riverkeeper and Black Warrior Riverkeeper deployed PFASsive™ passive sampling devices and duplicate sampling devices immediately upstream and downstream of the Beltona Land Reclamation Site in Cane Creek to determine its contribution of PFAS contamination to that waterway. The devices were deployed from August 20, 2024 to September 17, 2024. Both upstream and downstream sampling sites detected multiple types of PFAS. However, the concentrations of eight types of PFAS increased at the downstream sites, resulting in a total PFAS concentration increase of 28.54 ppt—an increase of 201.84%—in the primary samples,[195] and an increase of 18.12 ppt (140.47%) in the duplicate samples. PFPeA and PFBA were detected at the highest concentrations—both 11 ppt.

In the primary and duplicate samples, the concentration of PFHpA increased from 0.54 ppt to 1.7 ppt (214.81%) and a non-detect to 1.4 ppt, respectively. The concentration of PFHxA in the primary and duplicate samples increased from 1.2 ppt to 4.2 ppt (250%) and 1 ppt to 3.1 ppt (210%). Also, the concentration of PFBA in the primary and duplicate samples increased from 3.8 ppt to 11 ppt (189.47%) and 2.7 ppt to 6.4 ppt (137.04%). Multiple other types of

Beltona Land Reclamation Site | Cane Creek



● PFAS Phase II Sampling Site ● Biosolids Land Application Fields

PFAS increased in downstream samples at levels ranging from 52.63% to 127.78% in the primary sample and 34.15% to 126.67% in the duplicate samples. These results indicate that the Cahaba River/Valley Creek WWTPs' biosolids land application site is likely a significant source of PFAS in Cane Creek, a tributary to the Locust Fork, which is a tributary to the Black Warrior River.

The concentration of regulated PFAS increased downstream from the biosolids land application field, including PFOS, PFOA, and PFNA. Downstream concentrations of PFAS demonstrate that the surface water at this location is unsafe for drinking without advanced treatment. For example, the downstream concentration of PFOA was 4.1 ppt, which is 0.1 ppt greater than the MCL, and the concentration of PFOS was 5.8 ppt, which is 1.8 ppt greater than the MCL.

The concentrations of PFOA and PFOS in the downstream sample also exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. In the downstream sample, PFOA exceeded the draft HHWQC (Water + Organism) of 0.0009 ppt by 4.0991 ppt, and PFOS exceeded the 0.06 ppt criteria by 5.74 ppt. There are no national or state Clean Water Act surface water quality criteria for the protection of human health that apply to certain PFAS that were detected at elevated levels, including PFPeA, PFBA, PFHxA, PFHpA, and PFNA. However, PFOA, PFOS, PFNA, and PFHxS exceeded EWG's health-based criteria. *See Table 31 (below).*

This evaluation indicates that Cahaba River WWTP's land application site is likely contributing a significant amount of PFAS to Cane Creek and that multiple industrial dischargers to the facility are likely contributing to the WWTP's discharge of PFAS to the waterway. This pollution will likely continue to create significant risks to human health until PFAS pretreatment limits are placed on industrial sources of PFAS discharging into the facility and PFAS limits are placed in the Cahaba River WWTP's NPDES permit, which will require installation of PFAS treatment technology, limits on biosolids land application, and a plan to safely manage PFAS removed during the treatment process.

Table 31 | Cane Creek Upstream and Downstream from Biosolids Site

Analyte	Sample (ppt)				Duplicate Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	Upstream	Downstream	Change	% Change	Upstream	Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFPeA	0	11	11	n/a	0	6.1	6.1	n/a					1000	
PFBA	3.8	11	7.2	189.47%	2.7	6.4	3.7	137.04%					1000	
PFHxA	1.2	4.2	3	250.00%	1	3.1	2.1	210.00%					1000	
PFOA	1.8	4.1	2.3	127.78%	1.5	3.4	1.9	126.67%	4	0.1	0.0009	4.0991	0.09	4.01
PFOS	3.8	5.8	2	52.63%	4.1	5.5	1.4	34.15%	4	1.8	0.06	5.74	0.3	5.5
PFBS	1.4	2.7	1.3	92.86%	1.4	2.5	1.1	78.57%			400		2000	
PFHpA	0.54	1.7	1.16	214.81%	0	1.4	1.4	n/a					1000	
PFNA	0	0.68	0.68	n/a	0	0.62	0.62	n/a	10				0.006	0.674
PFHxS	1.6	1.5	-0.1	-6.25%	2.2	2	-0.2	-9.09%	10				0.001	1.499
Total PFAS	14.14	42.68	28.54	201.84%	12.9	31.02	18.12	140.47%						

Non-detect recorded as 0   Downstream Increase   Exceed criteria levels

SAMPLING RESULTS BY WATERKEEPER GROUP WATERSHED[196]

Bayou City Waterkeeper, Hunting Bayou, Texas
Wastewater Treatment Plant Site

The Hunting Bayou watershed spans the city limits of Houston, Galena Park, and Jacinto City, with an estimated population of 75,627. The Homestead WWTP, a municipal wastewater treatment facility, serves 7,961 people and discharges treated wastewater to Hunting Bayou.[197] Within one mile of the facility, 97% of residents are people of color, and 68% are low-income. EPA has identified approximately 1,405 potential PFAS-discharging facilities within Houston.[198]

Samples taken upstream and downstream from a WWTP outfall on Hunting Bayou were contaminated with multiple types of PFAS, and seven types of PFAS were detected at increased concentrations at the downstream site. Regulated PFAS were detected downstream from the WWTP, including PFOA, PFNA, PFHxS, and PFOS.[199] While PFAS levels increased downstream from the WWTP, the difference between upstream and downstream concentrations was not significant for most PFAS with the exception of PFHxA, which increased by 4.2 ppt (61.76%). However, the total PFAS concentration increased by 5.7 ppt (9.87%).

The PFAS contamination, both upstream and downstream, has rendered the surface water unsafe for drinking without advanced treatment, with PFOS (4 ppt) at the level of the MCL and PFOS exceeding the MCL by 8 ppt. PFOS and PFOA also exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. Multiple PFAS exceeded EWG's health-based criteria. *See Table 32 (below).*

Table 32 | Hunting Bayou Upstream and Downstream from Homestead WWTP

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	Upstream	Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	6.30	6.20	-0.10	-1.59%					1000	
PFPeA	8.70	9.30	0.60	6.90%					1000	
PFHxA	6.80	11.00	4.20	61.76%					1000	
PFHpA	3.70	3.40	-0.30	-8.11%					1000	
PFOA	3.70	4.00	0.30	8.11%	4		0.0009	3.9991	0.09	3.91
PFNA	1.20	1.30	0.10	8.33%	10				0.006	1.29
PFDA	0.55	0.64	0.09	16.36%					0.006	0.63
PFBS	9.40	11.00	1.60	17.02%			400		2000	
PFPeS	0.72	0.63	-0.09	-12.50%					1	
PFHxS	4.70	4.00	-0.70	-14.89%	10				0.001	4.00
PFOS	11.00	12.00	1.00	9.09%	4	8.00	0.06	11.94	0.3	11.70
6:2 FTS	1.00	0.00	-1.00	-100.00%					1	
Total PFAS	57.77	63.47	5.70	9.87%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Chattahoochee Riverkeeper, Chattahoochee River, Georgia
Wastewater Treatment Plant Site

The Chattahoochee River Basin, also known as the Apalachicola-Chattahoochee-Flint basin, covers an area of 8,770 square miles. The Chattahoochee River flows southwest for 434 miles, starting in the southern Appalachian Mountains, passing through the Atlanta metropolitan area, and ending at Lake Seminole. The river provides 70 percent of Atlanta's drinking water. The City of Atlanta's R.M. Clayton WRC, Cobb County's R.L. Sutton WRF, and the West Area WQCF discharge treated wastewater into the Chattahoochee River.[200] Of the people living within one mile of these facilities, 42% are people of color and 17% are low-income. EPA has identified approximately 290 potential PFAS-discharging facilities within the City of Atlanta, which is served by multiple wastewater treatment plants.[201]

Samples taken upstream and downstream from the facilities' outfalls to the Chattahoochee River were contaminated with multiple types of PFAS. Nine types of PFAS were detected at elevated levels downstream from the discharge points, including PFPeA at 6.1 ppt (74.29% increase) and PFTeA at 4.1 ppt (upstream sample was non-detect). The total PFAS concentration increased by 15.58 ppt (88.93%). Federally regulated PFAS were detected downstream at increased levels, including PFBS and PFOA. PFOA and PFOS exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. PFOA, PFDoA, PFTeA, PFHxS, PFOS, and PFMPA also exceeded the EWG health-based criteria. *See Table 33 (below).*

Table 33 | Chattahoochee River Upstream and Downstream from The City of Atlanta's R.M Clayton WRC, Cobb County's R.L. Sutton WRF, and the West Area WQCF

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	Upstream	Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	1.6	2.1	0.5	31.25%					1000	
PFPeA	3.50	6.10	2.60	74.29%					1000	
PFHxA	3.20	4.60	1.40	43.75%					1000	
PFHpA	0.82	1.50	0.68	82.93%					1000	
PFOA	2.70	2.80	0.10	3.70%	4		0.0009	2.7991	0.09	2.71
PFDoA	0.00	1.20	1.20	n/a					0.006	1.194
PFTeA	0.00	4.10	4.10	n/a					0.006	4.094
PFBS	1.30	4.30	3.00	230.77%			400		2000	
PFHxS	1.80	1.70	-0.10	-5.56%	10				0.001	1.699
PFOS	2.60	2.60	0.00	0.00%	4		0.06	2.54	0.3	2.30
PFMPA	0.00	2.10	2.10	n/a					1	1.10
Total PFAS	17.52	33.10	15.58	88.93%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Coosa Riverkeeper, Big Wills Creek and Whippoorwill Creek, Alabama

Wastewater Treatment Plant and Biosolids Sites

The Coosa River Basin spans more than 10,000 square miles and flows over 280 miles from northwestern Georgia to central Alabama. The Lower Coosa River Basin is home to up to 46 federally protected species, and is considered one of the most biodiverse ecosystems in the world. Big Wills Creek is a tributary to the Coosa River and Whippoorwill Creek is a tributary to the Locust Fork River in the Black Warrior River watershed. The Rainbow City WWTP is a municipal facility that discharges treated wastewater to Big Wills Creek.[202] The facility does not receive discharges from significant industrial users. Of the people living within one mile of the Rainbow City WWTP, 24% are people of color and 38% are low-income.

The Rainbow City WWTP is a municipal facility that produces approximately 1,400 lbs/day of Class B biosolids, which is stored in a biosolids lagoon. Since 2023, the plant has contracted with Denali Water Systems to transport biosolids to the Dennis Burton Farm in Altoona, Alabama, where it is land-applied as fertilizer for growing crops in the Whippoorwill Creek watershed.[203] According to Denali's nutrient management plan, about 125 acres of land receive the plant's biosolids each year.

Samples of Big Wills Creek upstream and downstream from a Rainbow City WWTP outfall contained multiple types of PFAS.[204] No significant increases were observed between upstream and downstream samples, with the exception of FOSA (non-detect to 1.6 ppt increase). Numerous PFAS decreased in the downstream sample, as did the total PFAS concentration by 2.33 ppt (15.49%). These results could have been influenced by factors such as backflow from the Coosa River, season, precipitation, discharge schedules, and leachate contributions. At the downstream site, PFOA and PFOS exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. PFOA, PFNA, PFHxS, PFOS, and FOSA also exceeded the EWG health-based criteria. *See Table 34 (below).*

Table 34 | Big Wills Creek Upstream and Downstream from Rainbow City WWTP

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	Upstream	Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	1.80	1.90	0.10	5.56%					1000	
PFPeA	2.70	0.00	-2.70	-100.00%						
PFHxA	2.70	2.60	-0.10	-3.70%					1000	
PFHpA	0.96	0.95	-0.01	-1.04%					1000	
PFOA	2.00	2.20	0.20	10.00%	4		0.0009	2.1991	0.09	2.11
PFNA	0.58	0.54	-0.04	-6.90%	10				0.006	0.534
PFDA	0.65	0.00	-0.65	-100.00%					0.006	
PFBS	0.82	0.58	-0.24	-29.27%			400		2000	
PFHxS	0.63	0.64	0.01	1.59%	10				0.001	0.639
PFOS	2.20	1.70	-0.50	-22.73%	4		0.06	1.64	0.3	1.40
FOSA	0.00	1.60	1.60	n/a					0.3	1.30
Total PFAS	15.04	12.71	-2.33	-15.49%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

The designated upstream and downstream sampling sites in Whippoorwill Creek near the Rainbow City WWTP's biosolids land application site, which is located in the Black Warrior River watershed, also contained PFAS. Due to sampling location constraints, the upstream sampling site was adjacent to one of the biosolids application fields. PFAS decreased significantly between upstream and downstream samples, with many downstream samples showing non-detect for multiple PFAS. The total PFAS concentration also decreased by 11.75 ppt (83.81%). At the upstream site, PFOS (5.6 ppt), exceeded the MCL, rendering the surface water at this location unsafe for drinking without advanced treatment. At the upstream and downstream sites, PFOA and PFOS exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. PFOA and PFOS also exceeded the EWG health-based criteria at the downstream site. *See Table 35 (below).*

Table 35 | Whippoorwill Creek Upstream and Downstream from Biosolids Land Application Sites

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	Upstream	Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	1.8	0.00	-1.80	-100.00%					1000	
PFHxA	0.86	0.00	-0.86	-100.00%					1000	
PFHpA	0.72	0.00	-0.72	-100.00%					1000	
PFOA	2.4	0.77	-1.63	-67.92%	4		0.0009	0.7691	0.09	0.68
PFBS	1.7	0.00	-1.70	-100.00%			400		2000	
PFHxS	0.94	0.00	-0.94	-100.00%	10				0.001	
PFOS	5.6	1.5	-4.10	-73.21%	4		0.06	1.44	0.3	1.20
Total PFAS	14.02	2.27	-11.75	-83.81%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Hackensack Riverkeeper, Ramapo River, New York/New Jersey
Wastewater Treatment Plant Site

The Ramapo River Basin, located in southeastern New York State and northeastern New Jersey, covers approximately 935 square miles and is a major tributary of the Passaic River. Sampling was conducted on the Ramapo River upstream and downstream from two municipal WWTPs that discharge to the Ramapo River: the Suffern (V) STP and the Western Ramapo WWTP.[205] The Suffern (V) STP serves a population of 13,000 people. Within one mile of the Western Ramapo WWTP, 56% of residents are people of color and 27% are low-income. New York State has also designated this area as a Disadvantaged Community.[206] The EPA has identified eight potential PFAS-discharging facilities within the Cities of Suffern and Hillburn.[207]

Samples of the Ramapo River upstream and downstream from the WWTPs' outfalls contained multiple types of PFAS.[208] At the downstream site in Mahwah, New Jersey just across the border from Suffern, New York, five types of PFAS were detected at elevated levels, including PFHxA at 10 ppt (2.5 ppt increase), PFHxS at 3.5 ppt (non-detect at upstream site), and PFBS at 2.5 ppt (non-detect at upstream site). The total PFAS concentration increased by 10.10 ppt (45.7%). Federally regulated PFAS were detected downstream at increased levels, including PFOA (6.7 ppt), PFBS, PFOS (4.7 ppt), and PFHxS. PFOA and PFOS exceeded the MCLs at the downstream site, rendering the surface water at this location unsafe for drinking without advanced treatment. PFOA and PFOS also exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. The PFOS concentration in the downstream sample exceeded New York's water quality guidance values for protection of human health in raw source water[209] and PFOA, PFOS, and PFHxS also exceeded the EWG health-based criteria. *See Table 36 (below).*

Table 36 | Ramapo River Upstream and Downstream from WWTP and STP

Analyte	Sample (ppt)					MCL (ppt)		EPA (ppt)		EWG (ppt)		NY MCL (ppt)		State Ambient WQ for HH (DW) (ppt)	
	Upstream	Downstream	Change	% Change	Upstream (August)	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	0.00	0.00	0.00	0.00%	3.30					1000					
PFPeA	5.40	4.80	-0.60	-11.11%	9.10					1000					
PFHxA	7.50	10.00	2.50	33.33%	5.90					1000					
PFHpA	0.00	0.00	0.00	0.00%	2.20					1000					
PFOA	6.10	6.70	0.60	9.84%	5.20	4	2.70	0.0009	6.6991	0.09	6.61	10		6.7	
PFNA	0.00	0.00	0.00	0.00%	1.60	10				0.006					
PFUnA	0.00	0.00	0.00	0.00%	0.97					0.006					
PFBS	0.00	2.50	2.50	n/a	1.30			400		2000					
PFHxS	0.00	3.50	3.50	n/a	1.00	10				0.001	3.50				
PFOS	3.10	4.70	1.60	51.61%	3.90	4	0.70	0.06	4.64	0.3	4.40	10		2.7	2.00
FOSA	0.00	0.00	0.00	0.00%	0.56					0.3					
Total PFAS	22.10	32.20	10.10	45.70%	35.03										

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

James Riverkeeper, Appomattox River and Old Town Creek, Virginia
Wastewater Treatment Plant and Biosolids Sites

The James River, Virginia's largest river, flows 340 miles and connects to 25,000 miles of tributaries, including the Appomattox River. Its watershed spans approximately 10,000 square miles, making up nearly a quarter of the state. About one-third of Virginians live within this watershed. Within one mile of the South Central WWTP,[210] a wastewater treatment system serving five localities and discharging effluent to the Appomattox River, 56% are people of color and 33% are low income. EPA has identified 29 potential PFAS-discharging facilities in Petersburg.[211]

Samples of the Appomattox River upstream and downstream from a South Central WWTP outfall contained multiple types of PFAS. However, the concentrations of several of PFAS increased slightly at the downstream site resulting in a total PFAS concentration increase of 0.5 ppt—an increase of 2.37%. PFOA (2.6 ppt) and PFOS (2.6 ppt) were detected in downstream samples at levels that exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. PFOA, PFOS, PFNA, and PFHxS also exceeded the EWG health-based criteria. *See Table 37 (below).*

South Central WWTP's method for disposing of its biosolids is through land application.[212] The facility produces Class B biosolids, which it prepares for land application through dewatering followed by lime stabilization. According to South Central WWTP's Biosolids Facility Report,[213] the facility produced and land applied 3,426 dry metric tons of biosolids in 2023, however, the land application is handled by Synagro Central, LLC, which sources biosolids for land application from multiple WWTPs.[214] For purposes of this project, James Riverkeeper conducted PFAS sampling downstream from a Synagro biosolids land application field, VA-CH-00004-0-0010, located in the Old Town Creek watershed.[215]

Table 37 | Appomattox River Upstream and Downstream from South Central WWTP

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	Upstream	Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	5.80	4.50	-1.30	-22.41%					1000	
PFPeA	3.50	4.40	0.90	25.71%					1000	
PFHxA	2.90	2.80	-0.10	-3.45%					1000	
PFHpA	1.20	1.10	-0.10	-8.33%					1000	
PFOA	2.40	2.60	0.20	8.33%	4		0.0009	2.5991	0.09	2.51
PFNA	0.00	0.75	0.75	n/a	10				0.006	0.744
PFBS	2.10	2.30	0.20	9.52%			400		2000	
PFHxS	0.57	0.56	-0.01	-1.75%	10				0.001	0.559
PFOS	2.10	2.60	0.50	23.81%	4		0.06	2.54	0.3	2.30
PFMPA	0.54	0.00	-0.54	-100.00%					1	
Total PFAS	21.11	21.61	0.50	2.37%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Samples of Old Town Creek taken downstream from the biosolids land application site detected multiple types of PFAS. The PFAS detected at the highest concentrations were PFOA (3.9 ppt) and PFOS (3.1 ppt). The concentrations of PFOA and PFOS in the sample taken downstream from the land application site also exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. In the downstream sample, PFOA exceeded the draft HHWQC (Water + Organism) of 0.0009 ppt by 3.8991 ppt, and PFOS exceeded the 0.06 ppt criteria by 3.04 ppt. Additionally, PFHxS, PFOA, and PFOS exceeded EWG's health-based criteria. *See Table 38 (below).*

Table 38 | Old Town Creek Downstream from Biosolids Land Application Field

Analyte	Sample (ppt)	MCL (ppt)		EPA (ppt)		EWG (ppt)	
	Downstream	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	1.3					1000	
PFPeA	1.7					1000	
PFHxA	1.7					1000	
PFHpA	0.81					1000	
PFOA	3.9	4		0.0009	3.8991	0.09	3.81
PFBS	1.3			400		2000	
PFHxS	1.5	10				0.001	1.499
PFOS	3.1	4		0.06	3.04	0.3	2.80
Total PFAS	15.31						

Non-detect recorded as 0 Exceed criteria levels

Long Island Soundkeeper, Naugatuck River, Connecticut
Wastewater Treatment Plant Site

The Naugatuck River Watershed spans 311 square miles and drains into the Naugatuck River, the only major river entirely within Connecticut and the largest tributary of the Housatonic River. Waterbury WPCF is a wastewater treatment system that serves approximately 125,000 residents of Waterbury and three other communities and handles wastewater from industrial dischargers.[216] Within one mile of the Waterbury WPCF, 44% of residents are people of color and 29% are low-income. The WWTP discharges treated wastewater to the Naugatuck River. EPA has identified 38 active PFAS-discharging facilities within the City of Waterbury.[217]

Samples of the Naugatuck River upstream and downstream from Waterbury WPCF outfalls contained multiple types of PFAS. However, the concentrations of seven types of PFAS increased at the downstream site resulting in a total PFAS concentration increase of 4.9 ppt—an increase of 11.78%. For example, the concentration of PFHxA increased from 7.1 ppt to 8.9 ppt (25.35%).

Federally regulated PFAS were also detected downstream at increased levels, including PFOS (8.3 ppt), PFBS (3.1 ppt), and PFHxS (1.7 ppt). However, the concentration of PFOA decreased slightly from 8.1 ppt to 7.8 ppt (3.7% decrease). PFOA exceeded the MCL by 3.8 ppt and PFOS exceeded the MCL by 4.3 ppt, rendering the surface water at this location unsafe for drinking without advanced treatment. PFOA and PFOS also exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. PFOA, PFNA, PFHxS, and PFOS also exceeded the EWG health-based criteria. *See Table 39 (below).*

Table 39 | Naugatuck River Upstream and Downstream from Waterbury WPCF

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)		State DW Action Level (ppt)	
	Upstream	Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	3.60	4.80	1.20	33.33%					1000		1800	
PFPeA	6.90	8.10	1.20	17.39%					1000			
PFHxA	7.10	8.90	1.80	25.35%					1000		240	
PFHpA	2.50	2.60	0.10	4.00%					1000			
PFOA	8.10	7.80	-0.30	-3.70%	4	3.80	0.0009	7.7991	0.09	7.71	16	
PFNA	1.50	1.20	-0.30	-20.00%	10				0.006	1.194	12	
PFBS	2.70	3.10	0.40	14.81%			400		2000		760	
PFHxS	1.60	1.70	0.10	6.25%	10				0.001	1.699	49	
PFOS	7.60	8.30	0.70	9.21%	4	4.30	0.06	8.24	0.3	8.00	10	
Total PFAS	41.60	46.50	4.90	11.78%								

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Los Angeles Waterkeeper, Los Angeles River, California
Wastewater Treatment Plant Site

The Los Angeles (LA) River Watershed spans 834 square miles, with the river stretching 51 miles from its headwaters in the Angeles National Forest to the Pacific Ocean in Long Beach. The LA-Glendale WRP is a municipal wastewater treatment system that is co-owned by the Cities of Los Angeles and Glendale, and operated by LA Sanitation, that serves a population of approximately 434,000 residents and handles wastewater from multiple industrial dischargers.[218] Within one mile of the LA River, there are 17 cities, 23 City of LA neighborhoods, and four unincorporated communities, and nearly 1,000,000 residents.[219] Within one mile of the LA-Glendale WRF, 54% of the population are people of color and 39% are low-income. Data for industrial discharges from the LA-Glendale WRF are aggregated with those from three other reclamation plants. In 2021, these four facilities received discharges from 166 permitted industrial users. EPA has identified 23 facilities in the City of Glendale alone as potential sources of PFAS discharges.[220]

Samples of the LA River upstream and downstream from the LA-Glendale WRF outfall contained multiple types of PFAS. However, the concentrations of five types of PFAS increased at the downstream site resulting in a total PFAS concentration increase of 6.01 ppt—an increase of 8.61%. For example, the concentration of PFPeA increased from 12 ppt to 20 ppt (66.67% increase) and the concentration of PFBA increased from 7.8 ppt to 9.8 ppt (25.64% increase).

Federally regulated PFAS were also detected downstream but at decreased concentrations, including PFOA (1.04% decrease) and PFOS (13.24% decrease). However, in the downstream sample, PFOA (9.5 ppt) exceeded the MCL by 5.5 ppt and PFOS (5.9 ppt) exceeded the MCL by 1.9 ppt, indicating the surface water at this location is unsafe for drinking without advanced treatment. Additionally, PFOA exceeded the California Public Health Goal of 0.007 ppt by 9.493 ppt and PFOS exceeded the California Public Health Goal of 1 ppt by 4.9 ppt.[221] PFOA and PFOS also exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody, and PFOA, PFOS, PFDA, and PFHxS exceeded the EWG health-based criteria. *See Table 40 (below).*

Table 40 | Los Angeles River Upstream and Downstream from LA-Glendale WRF

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)		CA Public Health Goal (ppt)		CA Notification Level (ppt)	
	Upstream	Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	7.80	9.80	2.00	25.64%					1000					
PFPeA	12.00	20.00	8.00	66.67%					1000					
PFHxA	19.00	20.00	1.00	5.26%					1000					
PFHpA	3.10	3.30	0.20	6.45%					1000					
PFOA	9.60	9.50	-0.10	-1.04%	4	5.50	0.0009	9.4991	0.09	9.41	0.007	9.493		
PFNA	1.10	0.00	-1.10	-100.00%	10				0.006					
PFDA	2.00	2.10	0.10	5.00%					0.006	2.094				
PFBS	3.70	2.50	-1.20	-32.43%			400		2000				500	
PFPeS	0.57	0.00	-0.57	-100.00%					1					
PFHxS	3.50	2.70	-0.80	-22.86%	10				0.001	2.699			3	
PFOS	6.80	5.90	-0.90	-13.24%	4	1.90	0.06	5.84	0.3	5.60	1	4.90		
NEtFOSAA	0.62	0.00	-0.62	-100.00%					1					
Total PFAS	69.79	75.80	6.01	8.61%										

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Narragansett Bay Riverkeeper, Pawtuxet River, Rhode Island
Wastewater Treatment Plant Site

The Pawtuxet River Watershed is the second largest watershed in Rhode Island, covering 231 square miles and it is home to approximately 235,000 residents. The Cranston WPCF is a municipal wastewater treatment system serving around 73,200 residents.[222] Within one mile of the Cranston WPCF, 25% of residents are people of color and 18% are low-income. The facility discharges treated wastewater to the Pawtuxet River. EPA has identified 42 potential PFAS-discharging facilities within Cranston.[223]

Samples of the Pawtuxet River upstream and downstream from WPCF outfalls contained multiple types of PFAS. The concentrations of five types of PFAS slightly increased at the downstream site. However, there was not a significant difference between the two sites, with the downstream site showing a total PFAS concentration increase of 0.6 ppt—an increase of 1.57%. The PFOS concentration decreased slightly by 0.2 ppt.

Federally regulated PFAS were detected downstream, including PFOA (7.7 ppt), PFBS (1.5 ppt), PFOS (4.3 ppt), PFNA (2.1 ppt), and PFHxS (2.3 ppt). PFOA exceeded the MCL by 3.7 ppt and PFOS exceeded the MCL 0.3 ppt, rendering the surface water at this location unsafe for drinking without advanced treatment. However, the PFOA concentration decreased in the downstream duplicate sample and the upstream duplicate concentration was also higher than the downstream primary sample concentration by 0.1 ppt. PFOA and PFOS also exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody, and PFOA, PFNA, PFHxS, and PFOS exceeded the EWG health-based criteria.
See Table 41 (below).

Table 41 | Pawtuxet River Upstream and Downstream from Cranston WPCF

Analyte	Sample (ppt)				Duplicate Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)		RI MCL (ppt)		RI SWQ Action Level (ppt)	
	Upstream	Downstream	Change	% Change	Upstream	Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	3.20	3.10	-0.10	-3.13%	3.30	3.20	-0.10	-3.03%					1000				Sum of 8 => 70 ppt	
PFPeA	5.50	5.70	0.20	3.64%	5.40	5.30	-0.10	-1.85%					1000					
PFHxA	7.40	7.20	-0.20	-2.70%	6.70	7.30	0.60	8.96%					1000					
PFHpA	4.80	4.90	0.10	2.08%	4.60	4.90	0.30	6.52%					1000					
PFOA	7.10	7.70	0.60	8.45%	7.80	7.50	-0.30	-3.85%	4	3.70	0.0009	7.6991	0.09	7.61				
PFNA	2.00	2.10	0.10	5.00%	2.00	1.90	-0.10	-5.00%	10				0.006	2.094				
PFBS	1.50	1.50	0.00	0.00%	1.70	1.50	-0.20	-11.76%			400		2000					
PFHxS	2.20	2.30	0.10	4.55%	2.20	2.30	0.10	4.55%	10				0.001	2.299				
PFOS	4.50	4.30	-0.20	-4.44%	4.70	4.30	-0.40	-8.51%	4	0.30	0.06	4.24	0.3	4.00				
Total PFAS	38.20	38.80	0.60	1.57%	38.40	38.20	-0.20	-0.52%										

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Pearl Riverkeeper, Pearl River, Mississippi
Wastewater Treatment Plant and Biosolids Sites

The Pearl River Basin spans 8,760 square miles in Central and Southern Mississippi and three Louisiana parishes, eventually draining in the Mississippi Sound, Lake Borgne, and the Gulf of Mexico. It is home to nearly one million people, more than one-third of Mississippi's population. There are three WWTPs located near one or more of the locations selected for sampling by Pearl Riverkeeper—Jackson POTW, Savannah Street, West Rankin Utility Authority WWTF, and Jackson POTW, Trahon and Big Creek.[224] Within one mile of the Jackson POTW, Savanna Street, 80% of residents are people of color and 60% are low-income. The EPA has identified 50 potential PFAS-discharging facilities within the City of Jackson.[225]

Pearl Riverkeeper sampled upstream and downstream from two separate outfalls into the Pearl River from Jackson POTW, Savannah Street and West Rankin Utility Authority WWTF. These two outfalls are approximately 1.6 river miles apart. A tributary stream also flows into the Pearl River between the upstream and downstream sampling locations. The upstream sampler was not recovered so no results are available for that location. The sample from the downstream location contained eight types of PFAS. Overall, the total PFAS concentration at the downstream location was 20.71 ppt. PFHxA (4.4 ppt) and PFBA (3.6 ppt) were detected at the highest concentrations. The federally regulated PFAS detected downstream included PFOA (2.9 ppt), PFBS (3 ppt), PFOS (3.5 ppt), PFNA (0.71 ppt), and PFHxS (1.3 ppt). PFOA and PFOS exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody, and PFOA, PFNA, PFHxS, and PFOS exceeded the EWG health-based criteria. *See Table 42 (below)*

Pearl Riverkeeper also collected additional samples at two locations further downstream. One sampling site was located upstream and the other sampling site was located downstream from where Big Creek enters the Pearl River. One or more of Jackson POTW's biosolids application fields are located in the Big Creek watershed roughly 1.5–2.0 miles from the confluence of Big Creek and the Pearl River. Jackson POTW, Trahon and Big Creek also discharges into Big Creek above the confluence of Big Creek and the Pearl River. Samples of the Pearl River upstream and downstream from the Big Creek confluence contained multiple types of PFAS. The concentrations total PFAS decreased at the downstream site to 30.78 ppt, resulting in a total PFAS concentration decrease of 1.89 ppt (5.79%). However, three types of PFAS increased slightly at the downstream site, including PFPeA at 13 ppt (8.33% increase), PFDA at 0.73 ppt (4.29% increase), and PFOS at 3.6 ppt (9.09% increase).

PFOS (3.6 ppt) was the only federally regulated PFAS detected downstream at a slightly increased concentration. However, PFOA and PFOS both exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. PFOA, PFDA, PFHxS, and PFOS also exceeded the EWG health-based criteria. *See Table 43 (below).*

Table 42 | Pearl River Downstream from Jackson POTW, Savanna Street and West Rankin WWTF

Analyte	Sample (ppt)	MCL (ppt)		EPA (ppt)		EWG (ppt)	
	Downstream	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	3.60					1000	
PFHxA	4.40					1000	
PFHpA	1.30					1000	
PFOA	2.90	4		0.0009	2.8991	0.09	2.81
PFNA	0.71					0.006	0.704
PFBS	3.00			400		2000	
PFHxS	1.30	10				0.001	1.299
PFOS	3.50	4		0.06	3.44	0.3	3.20
Total PFAS	20.71						

Non-detect recorded as 0 Exceed criteria levels

Table 43 | Pearl River Upstream and Downstream from the Big Creek Confluence

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	Upstream	Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	4.2	3.8	-0.40	-9.52%					1000	
PFPeA	12	13	1.00	8.33%					1000	
PFHxA	3.2	3.2	0.00	0.00%					1000	
PFHpA	1.2	1.0	-0.20	-16.67%					1000	
PFOA	3.3	2.8	-0.50	-15.15%	4		0.0009	2.7991	0.09	2.71
PFNA	0.67	0.00	-0.67	-100.00%	10				0.006	
PFDA	0.70	0.73	0.03	4.29%					0.006	0.724
PFBS	3.1	1.7	-1.40	-45.16%	400				2000	
PFHxS	1.0	0.95	-0.05	-5.00%	10				0.001	0.949
PFOS	3.3	3.6	0.30	9.09%	4		0.06	3.54	0.3	3.30
Total PFAS	32.67	30.78	-1.89	-5.79%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Tampa Bay Waterkeeper, East Canal, Florida

Wastewater Treatment Plant Site

The Hillsborough River Watershed covers more than 675 square miles, including the City of Tampa. East Canal is a tributary to Itchepackesassa Creek, which flows into the Hillsborough River and, ultimately, into Hillsborough Bay. Plant City WRF, a municipal wastewater treatment system, owned and operated by the City of Plant City, serves a population of approximately 40,000 residents and discharges into the East Canal.[226] EPA has identified 27 potential PFAS-discharging facilities within Plant City.[227] Within one mile of the Plant City WRF, 58% of residents are people of color and 50% are low-income.

Samples of the East Canal taken downstream from a Plant City WRF outfall detected ten types of PFAS. PFBA (9 ppt), PFPeA (9.9 ppt), and PFOS (11 ppt) were detected at the highest concentrations. The downstream site had a total PFAS concentration of 58.91 ppt. Upstream samples were not collected. Federally regulated PFAS were detected at the downstream sampling site, including PFOA, PFNA, PFHxS, PFBS, and PFOS. PFOA (7.1 ppt) exceeded the MCL by 3.1 ppt, and PFOS exceeded the MCL by 7 ppt, rendering the surface water at this location unsafe for drinking without advanced treatment. PFOA and PFOS exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. PFOA, PFNA, PFHxS, and PFOS also exceeded the EWG health-based criteria. *See Table 44 (below).*

Table 44 | East Canal Downstream from Plant City WRF

Analyte	Sample (ppt)	MCL (ppt)		EPA (ppt)		EWG (ppt)		State Surface WQ HH Screening (ppt)	
	Downstream	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	9.00					1000			
PFPeA	9.90					1000			
PFHxA	6.30					1000			
PFHpA	3.70					1000			
PFOA	7.10	4	3.10	0.0009	7.0991	0.09	7.01	500	
PFNA	1.30	10				0.006	1.294		
PFBS	6.00			400		2000			
PFPeS	0.71					1			
PFHxS	3.90	10				0.001	3.899		
PFOS	11.00	4	7.00	0.06	10.94	0.3	10.70	10	1.00
Total PFAS	58.91								

Non-detect recorded as 0 Exceed criteria levels

WATERKEEPER ALLIANCE | PFAS REPORT PHASE II
ANALYSIS AND FINDINGS

Upper Potomac Riverkeeper, Opequon Creek and Back Creek, West Virginia

Wastewater Treatment Plant and Biosolids Sites

The Opequon Creek Watershed spans approximately 341 square miles across West Virginia and Virginia, with more than half of its area located in West Virginia. Opequon Creek flows into the Potomac River near Martinsburg, West Virginia. The Back Creek Watershed covers 374 square miles in Virginia and West Virginia, before flowing into the Potomac River near Allensville., West Virginia. Berkeley County operates four sewage treatment and collection systems pursuant to NPDES Permit WV0082759. One of those systems, Berkeley County PSSD—Inwood WWTP (Outlet 002) serves a population of 17,500 residents and discharges to Opequon Creek.[228] Of those living within one mile of Inwood WWTP, 13% are people of color and 20% are low income. EPA has identified 2 potential PFAS-discharging facilities within Inwood involving Chemical Manufacturing, Paints and Coatings, and Cleaning Products Manufacturing industries, however, its appears from the NPDES permit that these facilities discharge into a different Berkeley County PSSD facility.[229]

Samples of Opequon Creek upstream and downstream from an Inwood WWTP outfall contained multiple types of PFAS. While PFPeA, PFHxA, PFOA, and PFBS increased slightly downstream from the WWTP, PFOS slightly decreased, resulting in a total PFAS concentration increase of 1.8 ppt—an increase of 3.99%. Only PFPeA and PFBS increased by more than 1 ppt.

Regulated PFAS were detected in the downstream samples, including PFOA (4.1 ppt), PFHxS (3 ppt), PFBS (9.3 ppt), and PFOS (4.9 ppt). PFOA exceeded the MCL by 0.1 ppt and PFOS exceeded the MCL by 0.9 ppt, rendering the surface water at this location unsafe for drinking without advanced treatment. PFOA and PFOS also exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. PFOA, PFHxS, PFOS, and 8:2 FTS also exceeded the EWG health-based criteria. *See Table 45 (below).*

Table 45 | Opequon Creek Upstream and Downstream from Berkeley County PSSD—Inwood WWTP

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	Upstream	Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	3.50	3.40	-0.10	-2.86%					1000	
PFPeA	7.90	9.30	1.40	17.72%					1000	
PFHxA	6.50	7.20	0.70	10.77%					1000	
PFHpA	1.60	1.40	-0.20	-12.50%					1000	
PFOA	3.50	4.10	0.60	17.14%	4	0.10	0.0009	4.0991	0.09	4.01
PFBS	8.00	9.30	1.30	16.25%			400		2000	
PFHxS	3.30	3.00	-0.30	-9.09%	10				0.001	2.999
PFOS	5.30	4.90	-0.40	-7.55%	4	0.90	0.06	4.84	0.3	4.60
8:2 FTS	5.50	4.30	-1.20	-21.82%					1	3.30
Total PFAS	45.10	46.90	1.80	3.99%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Berkeley County PSSD is permitted to land-apply biosolids produced at its sewage collection and treatment systems.[230] Specifically, it is permitted to apply biosolids on fields at 11 agricultural sites at a maximum annual loading rate of 1.5 tons/acre. PFAS sampling was conducted upstream and downstream from the Dehaven Farm, one of Berkeley County PSSD's land application sites, located in the Back Creek watershed.

Samples of Back Creek upstream and downstream from the Dehaven biosolids land application site contained multiple types of PFAS. However, the concentrations of four types of PFAS increased slightly at the downstream site resulting in a total PFAS concentration increase of 0.61 ppt—an increase of 4.74%. For example, the concentration of PFPeA increased from a non-detect to 1.4 ppt.

Federally regulated PFAS were also detected in downstream samples, including PFOA (2 ppt), PFBS (1.7 ppt), PFHxS (1.8 ppt), and PFOS (2.1 ppt). PFOS and PFBS concentrations decreased slightly at the downstream site. PFOA and PFOS exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. PFOA, PFHxS, and PFOS also exceeded the EWG health-based criteria. *See Table 46 (below).*

Table 46 | Back Creek Upstream and Downstream from Biosolids Land Application Fields

Analyte	Sample (ppt)				Duplicate Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	Upstream	Downstream	Change	% Change	Upstream	Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	2.3	1.9	-0.40	-17.39%	1.9	2.5	0.60	31.58%					1000	
PFPeA	0.00	1.4	1.40	n/a	0.00	0.00	0.00	0.00%					1000	
PFHxA	1.8	1.7	-0.10	-5.56%	1.5	3.1	1.60	106.67%					1000	
PFHpA	0.86	0.87	0.01	1.16%	0.83	1.0	0.17	20.48%					1000	
PFOA	1.9	2.0	0.10	5.26%	2.3	2.2	-0.10	-4.35%	4		0.0009	1.9991	0.09	1.91
PFBS	2.3	1.7	-0.60	-26.09%	2.0	2.5	0.50	25.00%			400		2000	
PFHxS	1.4	1.8	0.40	28.57%	2.5	2.2	-0.30	-12.00%	10				0.001	1.799
PFOS	2.3	2.1	-0.20	-8.70%	3.2	2.7	-0.50	-15.63%	4		0.06	2.04	0.3	1.80
Total PFAS	12.86	13.47	0.61	4.74%	14.23	16.2	1.97	13.84%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

West Virginia Headwaters Waterkeeper, Ohio River, West Virginia

Wastewater Treatment Plant Site

The Ohio River's drainage basin covers 204,000 square miles, including most of West Virginia. The river flows 981 miles, providing drinking water to over five million people and handles wastewater from several industrial dischargers. The Parkersburg Utility Board WWTP serves approximately 100,000 residents.[231] Within one mile of the Parkersburg WWTP, 8% of residents are people of color and 56% are low-income. The facility discharges treated wastewater to the Ohio River. The EPA has identified 22 potential PFAS-discharging facilities within Parkersburg.[232]

Samples of the Ohio River upstream and downstream from a Parkersburg WWTP outfall contained multiple types of PFAS. However, only the concentration of PFBS increased slightly in the downstream sample. Federally regulated PFAS were detected downstream, including PFOA (3.4 ppt), PFNA (0.67 ppt), PFBS (1.6 ppt), PFHxS (0.99 ppt), and PFOS (3.1 ppt). PFOA and PFOS exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. PFOA, PFNA, PFHxS, and PFOS also exceeded the EWG health-based criteria. *See Table 47 (below).*

Table 47 | Ohio River Upstream and Downstream from Parkersburg WWTP

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	Upstream	Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	3.10	3.00	-0.10	-3.23%					1000	
PFPeA	2.70	2.60	-0.10	-3.70%					1000	
PFHxA	2.60	2.40	-0.20	-7.69%					1000	
PFHpA	1.10	1.10	0.00	0.00%					1000	
PFOA	4.10	3.40	-0.70	-17.07%	4		0.0009	3.3991	0.09	3.31
PFNA	0.85	0.67	-0.18	-21.18%	10				0.006	0.664
PFDA	0.55	0.00	-0.55	-100.00%					0.006	
PFBS	1.50	1.60	0.10	6.67%			400		2000	
PFHxS	1.10	0.99	-0.11	-10.00%	10				0.001	0.989
PFOS	3.90	3.10	-0.80	-20.51%	4		0.06	3.04	0.3	2.80
HFPO-DA (GenX)	0.45	0.00	-0.45	-100.00%	10				9	
Total PFAS	21.95	18.86	-3.09	-14.08%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

POLICY RECOMMENDATIONS

PFAS pose significant societal risks, including health issues, environmental contamination, and economic costs, particularly affecting disadvantaged communities. It is essential that PFAS is addressed by the government at both the federal, state, and tribal government levels. The following recommendations propose reforms that policymakers can adopt to prevent or mitigate PFAS pollution.

Federal Administrative Policy Reforms

Absent comprehensive reform, industry accountability, and substantial investment of federal funds to support affected communities, the short- and long-term harms of PFAS pollution will continue to grow. In May 2025, despite the urgent need for federal action, EPA announced plans to weaken existing national drinking water standards for PFAS. Specifically, the agency proposed rescinding standards for PFHxS, PFNA, and GenX (HFPO-DA), as well as the hazard index that includes those chemicals and PFBS. It also signaled delays in compliance deadlines and new industry loopholes for PFOA and PFOS.

Rather than weakening protections, EPA must finalize, adopt, and enforce pending reforms—including the draft HHWQC—to help stem the accumulation of PFAS in the nation's waterways.

Given the well-documented health risks, environmental persistence, and widespread presence of PFAS in surface waters, EPA must regulate these substances as a class rather than individually. This will prevent industries from shifting to unregulated but equally harmful alternatives. Production and use of PFAS should be phased out entirely. The federal government should also ban the land application of biosolids containing PFAS to stop their spread into the food chain.

At a minimum, EPA should lead a coordinated federal response to help state, tribal, and local governments address the public health emergency posed by PFAS. This must include the adoption of effluent limitation guidelines and pretreatment standards for industrial dischargers; enforceable drinking water limits for all PFAS under the SDWA; and national water quality criteria to protect both people and aquatic life under the CWA.

Where effluent guidelines are not yet in place, technology-based discharge limits must be developed using best professional judgment. Funding for wastewater treatment must increase to keep PFAS from being released into surface waters that are used for private and public drinking water, recreation, and fish/shellfish consumption.

Finally, the federal government must expand monitoring of PFAS in surface water, groundwater, and drinking water; strengthen health surveillance; advance scientific research; restore essential monitoring programs; and provide direct assistance to impacted communities—especially in rural areas with high levels of contamination.

Congressional Policy Reforms

Congress must take action to lessen PFAS' current impact on the public and adopt policies that will create a lasting difference. Several measures focused on funding, research, or regulatory oversight have already been introduced in Congress that, if passed, would improve public health outcomes related to PFAS.

Congress must provide increased funding for wastewater treatment facilities to update their systems to prevent PFAS from returning to the water supply. Congress also needs to provide funding for communities and individuals directly impacted by the failure to protect them from PFAS. As one example, H.R.1517, the Relief for Farmers Hit with PFAS Act, directs the Department of Agriculture to create a grant program to support financial assistance for farmers impacted by PFAS.[233] Farmers are especially impacted by the land application of biosolids to their fields.

Measures focused on regulatory improvements would lead to a more comprehensive governmental approach to PFAS. This includes reintroduction of the bipartisan, bicameral Clean Water Standards for PFAS Act, which requires EPA to develop water criteria for PFAS under the Clean Water Act, provides the agency with an achievable roadmap to establish ELGs and standards for eight priority industry categories for all measurable PFAS or classes of PFAS within three years, and includes significant federal support to assist communities in upgrading their municipal water infrastructure in order to safeguard public health and protect ratepayers.[234] S.820, the Protecting Consumers from PFAS Act, which would add the Consumer Product Safety Commission to the list of agencies required to be represented on the PFAS interagency working group, or H.R.5356, the PFAS Act, which would require the Secretary of Transportation to establish a PFAS replacement program at certain airports.

Congress must also fund and implement more strategic and coordinated monitoring of surface waters, groundwater, and drinking water supplies. H.R.5259, the PFAS Exposure Assessment and Documentation Act, shows how the government can invest in testing for PFAS in humans and working with individuals and healthcare systems to educate them and monitor for future risks. More funding is needed for all communities for this kind of health care.

State Policy Reforms

In 2023, at least 23 states passed 50 bills related to PFAS and, in 2024, at least 17 states passed more than 40 bills related to PFAS.[235] Sixteen states have started phasing out or restricting PFAS in various products, including apparel, carpets, cleaning products, cookware, dental floss, fire-fighting foam, food packaging, menstrual products, and personal care items.[236] Maine has enacted legislation to phase out the sale of products containing PFAS, and offers financial support to impacted farmers. Minnesota passed a measure prohibiting the use of PFAS in certain consumer products and food packaging. Michigan and New Jersey have established grants to provide financial assistance for addressing PFAS contamination in drinking water systems, and in 2020, New Jersey set drinking water standards for PFOA and PFOS. Additionally, California has banned the use of PFAS in food packaging and products intended for infants and children. In 2020, New Jersey set drinking water standards for PFOA and PFOS.

Several states have recently adopted prohibitions, strategies, or standards for biosolids testing and/or land application, including, relevant to this report, Connecticut, Maryland, Michigan, New York, and Wisconsin.[237] Numerous states have also adopted regulatory standards to control PFAS in surface waters. *See Table 12 (p. 39).* For example, California has established Public Health Goals (PHGs) for certain classes of PFAS that are more stringent than EPA's MCLs. While PHGs are nonregulatory, the State Water Resources Control Board uses them as a reference when determining the state's primary drinking water standards and MCLs.[238] New Jersey is conducting a study to assess the feasibility of establishing standards, such as MCLs, for the entire class or specific subclasses or mixtures of PFAS in drinking water, rather than for each substance individually.[239]

States should not wait for the federal government to act on PFAS; they can draw on existing solutions and take swift, decisive action on this critical issue.

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2 *Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS)*, NIEHS, www.niehs.nih.gov/health/topics/agents/pfc (last visited Mar. 27, 2025) ("PFAS are a group of nearly 15,000 synthetic chemicals, according to a chemicals database (CompTox) maintained by the U.S. Environmental Protection Agency.").

3 See, *e.g.*, *Our Current Understanding of the Human Health and Environmental Risks of PFAS*, EPA, www.epa.gov/pfas/our-current-understanding-human-health-and-environmental-risks-pfas (Nov. 26, 2024).

4 See, e.g., Kelly L. Smalling et al., Per- and Polyfluoroalkyl Substances (PFAS) in United States Tapwater: Comparison of Underserved Private-Well and Public-Supply Exposures and Associated Health Implications, 178 Env't Int'l 108033, 108034 (2023) www.sciencedirect.com/science/article/pii/S0160412023003069.

5 Draft Sewage Sludge Risk Assessment for Perfluorooctanoic Acid (PFOA) and Perfluorooctane Sulfonic Acid (PFOS), EPA, www.epa.gov/biosolids/draft-sewage-sludge-risk-assessment-perfluorooctanoic-acid-pfoa-and-perfluorooctane (Feb. 21, 2025).

6 This project is focused on WWTPs that collect and treat wastewater from domestic sewage, commercial businesses, and industries. See *Municipal Wastewater*, EPA www.epa.gov/npdes/municipal-wastewater (Apr. 19, 2024). These facilities are commonly referred to as municipal WWTPs (WWTPs), Sewage Treatment Plants (STPs), water resource recovery facilities (WRRF), publicly owned treatment works (POTWs), and similar names.

7 EPA, Information Collection Request 2799.01, Supporting Statement B, Publicly Owned Treatment Works (POTW) Influent Per- and Polyfluoroalkyl Substances (PFAS) Study and National Sewage Sludge Survey (NSSS) 1-2 ("[t]here are over 50 industrial categories regulated by Effluent Limitations Guidelines and Standards (ELGs) that do not have any PFAS requirements and additional industries that the EPA has determined historically or currently use PFAS but for which insufficient PFAS monitoring data has been identified.") (2024) www.epa.gov/system/files/documents/2024-10/pfas_potw-icr-supporting-statement-b.pdf.

8 In National Pollutant Discharge Elimination System (NPDES) permits under the Clean Water Act, 33 U.S.C. §§ 1251 *et seq.*, "[e]ffluent limitations serve as the primary mechanism… for controlling discharges of pollutants to receiving waters. When developing effluent limitations for an NPDES permit, a permit writer must consider limits based on both the technology available to control the pollutants (i.e., technology-based effluent limits) and limits that are protective of the water quality standards of the receiving water (i.e., water quality-based effluent limits)." *NPDES Permit Limits*, EPA, www.epa.gov/npdes/npdes-permit-limits (Sept. 16, 2024).

9 Under the Clean Water Act, "[p]retreatment standards are pollutant discharge limits which apply to industrial users [that discharge into municipal WWTPs]… [and] can be expressed as numeric limits, narrative prohibitions, and best management practices (BMPs)." *Pretreatment Standards and Requirements- Applicability*, EPA, www.epa.gov/npdes/pretreatment-standards-and-requirements-applicability (Sept. 16, 2024).

10 EPA, Information Collection Request 2799.01, Supporting Statement A, POTW Influent Per- and Polyfluoroalkyl Substances (PFAS) Study and National Sewage Sludge Survey (NSSS) 2 (2024) www.epa.gov/system/files/documents/2024-10/pfas_potw-icr-supporting-statement-a.pdf. ("The EPA has not established national technology-based numeric standards for PFAS in wastewater discharges and few states have developed water quality standards for PFAS. Therefore, few industrial facilities have PFAS monitoring requirements, effluent limitations, or pretreatment standards for wastewater discharges.")

11 EPA, Draft Sewage Sludge Risk Assessment for PFOA and PFOS, Public Webinar 4 (2025), www.epa.gov/system/files/documents/2025-01/draft-ra-public-webinar-slides.pdf.

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13 See, *e.g.*, EPA, Draft Sewage Sludge Risk Assessment for Perfluorooctanoic Acid (PFOA) CASRN 335-67-1 and Perfluorooctane Sulfonic Acid (PFOS) CASRN 1763-23-1, at 4 (2025), www.epa.gov/system/files/documents/2025-01/draft-sewage-sludge-risk-assessment-pfoa-pfos.pdf.

14 Kelly Hunter Foster & Daniel E. Estrin, Waterkeeper Alliance, Invisible Unbreakable Unnatural: PFAS Contamination of U.S. Surface Waters 7 (2022), waterkeeper.org/wp-content/uploads/2022/10/Waterkeeper-Alliance-PFAS-Report-FINAL-10.14.22.pdf.

15 *Id.* at 9.

16 We were able to obtain samples upstream and downstream from 20 WWTPs and 9 sludge land application fields. At two WWTPs and one sludge land application field, we were only able to obtain downstream samples.

17 EPA, Method 1633, Revision A, Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids, and Tissue Samples by LC-MS/MS (2024), www.epa.gov/system/files/documents/2024-12/method-1633a-december-5-2024-508-compliant.pdf (items previously posted in an errata table are addressed in the December 2024 version of EPA Method 1633A).

18 An equilibrium concentration reflects the point where the amount of PFAS in the sampled medium (here, it is surface water) and the sampler are in balance. See Blessing Medon et. al., *A Field-Validated Equilibrium Passive Sampler for the Monitoring of Per- and Polyfluoroalkyl Substances (PFAS) in Sediment Pore Water and Surface Water*, 25 Env't Sci.: Processes & Impacts 980, 981 (2023) pubs.rsc.org/en/content/articlepdf/2023/em/d2em00483f ("In passive sampling, the amount of analyte accumulated in the sampler increases with time until a dynamic equilibrium is established between the receiving phase and the sampled environment…. [T]he concentration of the analyte in the sampled medium is calculated based on the equilibrium partitioning of the analyte between the receiving phase and the sampled medium."); *see also PFASsive*™, Eurofins, www.eurofinsus.com/environment-testing/pfas-testing/services/passive-sampling/ (last visited Mar. 27, 2025) ("PFASsive™ can be used to provide critical data for fate and risk assessments, toxicity identification and remediation design and/or monitoring that is more representative than conventional grab samples as it quantifies contaminants only in the dissolved form.").

19 All publicly available information from multiple sources was gathered from January 1, 2024, through June 18, 2025. Information may have changed after the time of collection and may not be current at the time of publication.

20 33 U.S.C. §§ 1251 et seq.

21 See, e.g., Laura Gatz, Regulating PFAS Under the Clean Water Act, Cong. Rsch. Serv., www.congress.gov/crs_external_products/IF/PDF/IF12148/IF12148.5.pdf (Jan. 15, 2025).

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23 "Effluent Guidelines are national regulatory standards for wastewater discharged to surface waters and municipal sewage treatment plants. EPA issues these regulations for industrial categories, based on the performance of treatment and control technologies." Effluent Guidelines, EPA, https://www.epa.gov/eg (Mar. 21, 2025).

24 "The Clean Water Act prohibits anybody from discharging 'pollutants' through a 'point source' into a 'water of the United States' unless they have an NPDES permit. The permit will contain limits on what you can discharge, monitoring and reporting requirements, and other provisions to ensure that the discharge does not hurt water quality or people's health," NPDES Permit Basics, EPA www.epa.gov/npdes/npdes-permit-basics (May 23, 2025).

25 "The national pretreatment program is designed to: protect POTW infrastructure, and reduce conventional and toxic pollutant levels discharged by industries and other nondomestic wastewater sources into municipal sewer systems and into the environment," National Pretreatment Program, EPA www.epa.gov/npdes/national-pretreatment-program (May 23, 2025).

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27 Mapping the PFAS Contamination Crisis: New Data Show 9,323 Sites with PFAS in 50 States, the District of Columbia and Four Territories, EWG, www.ewg.org/interactive-maps/pfas_contamination/ (June 12, 2025); see also EPA, Multi-Industry Per- and Polyfluoroalkyl Substances (PFAS) Study – 2021 Preliminary Report 3-9 (2021), www.epa.gov/system/files/documents/2021-09/multi-industry-pfas-study_preliminary-2021-report_508_2021.09.08.pdf ("EPA's UCMR3 monitoring indicated that public water systems in 33 states serving 16.5 million residents had detectable levels of long- and short-chain PFAS. Sixty-six public water systems serving more than 6 million people were found to have at least one sample above 70 ng/L, EPA's lifetime health advisory (LHA) value for the sum of PFOA and PFOS in drinking water… .").

28 Per- and Polyfluoroalkyl Substances (PFAS) | State Legislation and Federal Action, Nat'l Conf. of State Legislatures, /www.ncsl.org/environment-and-natural-resources/per-and-polyfluoroalkyl-substances (Jan. 9, 2025).

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31 42 U.S.C. §§ 9601 et seq.

32 Human Health Water Quality Criteria for PFAS, EPA,www.epa.gov/wqc/human-health-water-quality-criteria-pfas (Feb. 21, 2025). EPA also published final national recommended water quality criteria for the protection of aquatic life for PFOA and informational benchmarks for 8 types of PFAS (PFBA, PFHxA, PFNA, PFDA, PFBS, PFHxS, 8:2 FTUCA, and 7:3 FTCA) on October 7, 2024, see Final Recommended Aquatic Life Criteria and Benchmarks for Select PFAS, 89 Fed. Reg. 810777 (Oct 7, 2024).

33 EPA Announces It Will Keep Maximum Contaminant Levels for PFOA, PFOS, www.epa.gov/newsreleases/epa-announces-it-will-keep-maximum-contaminant-levels-pfoa-pfos. (May 14, 2025)

34 33 U.S.C. § 1345(d); see also *Gatz, supra* note 21 ("Section 405(d) also requires EPA to review its biosolids regulations at least every two years to identify additional toxic pollutants that may be present in biosolids and promulgate regulations for those pollutants if sufficient scientific evidence shows they may adversely affect public health or the environment.").

35 Hiroko Tabuchi, The EPA Promotes Toxic Fertilizer. 3M told It of Risks Years Ago., N.Y. Times www.nytimes.com/2024/12/27/climate/epa-pfas-fertilizer-3m-forever-chemicals.html?unlocked_article_code=1.104.iE0j.fBMcId1eDgGp&smid=nytcore-ios-share&referringSource=articleShare (Jan. 2, 2025).

36 *Id.*

37 One sludge land application site, Virginia's Old Town Creek, did not have an upstream sample but significant concentrations were detected in the downstream sample. Two WWTP sites did not have upstream samples, Florida's East Canal and Mississippi's Pearl River, but significant concentrations were detected in both of the downstream samples.

38 See "Table 3: U.S. EPA Method 1633 Target Analytes" *(p. 19)*, for the unabbreviated scientific name for each type of PFAS discussed in this report.

39 EWG established a health-based guideline of 1 ppt for total PFAS based on the increased risk of cancer, reduced effectiveness of vaccines, and developmental harm. *PFAS*, Env't Working Grp., Tapwater Database (Feb. 2025), www.ewg.org/tapwater/reviewed-pfcs.php. According to EWG, the guideline was "based on studies by Phillipe Grandjean of Harvard University and many other independent researchers who found reduced effectiveness of vaccines and adverse impacts on mammary gland development from exposure to PFOA and PFOS, the two PFAS most widely detected in drinking water. This health guideline applies to the entire class of PFAS detected in water." *CONTAMINANT: Total Per- and Polyfluoroalkyl Substances*, Env't Working Grp., Tapwater Database www.ewg.org/tapwater/contaminant.php?contamcode=PFAS (last visited Mar. 25, 2025).

40 See *EJSCREEN: Environmental Justice Screening and Mapping Tool*, FEMA https://www.fema.gov/emergency-managers/practitioners/recovery-resilience-resource-library/ejscreen-environmental (Mar. 25, 2024). EPA removed EJScreen from its website on February 5, 2025. See EDGI_TEAM, *EPA Removes EJScreen from Its Website*, Env't Data & Governance Initiative (Feb. 12, 2025), envirodatagov.org/epa-removes-ejscreen-from-its-website; *EJScreen*, EPA, (last visited Feb. 4, 2025). However, Waterkeeper Alliance sourced and saved the project data. This data has also been preserved by Public Environmental Data Partners. See EJScreen Environmental Justice Screening and Mapping Tool (Version 2.3), Public Environmental Data Partners, https://pedp-ejscreen.azurewebsites.net/ (last visited June 17, 2025).

41 EJScreen includes socioeconomic data, including race and ethnicity, income, unemployment rate, English proficiency, education level, and age. EJScreen also includes data on environmental indicators, including particulate matter 2.5, ozone, nitrogen dioxide, diesel particulate matter, toxic releases to air, traffic proximity, lead paint, superfund proximity, risk management plan facility proximity, hazardous waste proximity, underground storage tanks, wastewater discharge, and drinking water non-compliance.

42 *POTW Influent PFAS Study*, EPA, www.epa.gov/eg/potw-influent-pfas-study (Feb. 5, 2025).

43 Under the Clean Water Act, EPA implements the sewage sludge regulations, 40 CFR Part 503, in 41 states and EPA has authorized nine states (Arizona, Idaho, Michigan, Ohio, Oklahoma, South Dakota, Texas, Utah, and Wisconsin) to administer the Part 503 regulations." Compliance and Annual Biosolids Reporting, EPA www.epa.gov/biosolids/compliance-and-annual-biosolids-reporting#:~:text=The%20U.S.%20Environmental%20Protection%20Agency,NPDES%20State%20Program%20Authorization%20Information (June 2, 2025).

44 Devices upstream from the WWTPs located on Florida's East Canal and Mississippi's Pearl River were not retrieved.

45 An upstream device was not placed above one sludge land application site located on Virginia's Old Town Creek.

46 The deployment period extended over 20 or more days for all samplers. The method requires a deployment date of at least 14 days to reach equilibrium. See *supra* note 18.

47 See *Invisible Unbreakable Unnatural*, Waterkeeper All., waterkeeper.org/pfas/ (last visited Mar. 28, 2025).

48 See *Per- and Polyfluoroalkyl Substances (PFAS), supra* note 29; Human Health Water Quality Criteria for PFAS, *supra* note 32.

49 See *Gatz, supra* note 21.

50 See *Tabuchi, supra* note 35.

51 See *Mapping the PFAS Contamination Crisis, supra* note 27.

52 See *State Legislation and Federal Action, supra* note 28.

53 *PFAS Analytic Tools*, EPA, awsedap.epa.gov/public/extensions/PFAS_Tools/PFAS_Tools.html (last visited Mar. 18, 2025).

54 GLWA WRRF has adopted a Local Limit for PFOS of 65 ppt (Daily Maximum). See Great Lakes Water Auth., IPP Rules_2024, at 16 (2024), glwa.wpenginepowered.com/wp-content/uploads/2025/01/IPP-Rules_2024.pdf.

55 See Public Webinar 4, *supra* note 11, at 6 (discussing findings in reference to PFOA and PFOS).

56 *Id.*

57 *Id.* at 9.

58 See *PFASsive* Eurofins, https://www.eurofinsus.com/environment-testing/pfas-testing/services/passive-sampling/ (last visited Mar. 25, 2025).

59 *PFASsive™: Passive Sampler for PFAS*, SiREM, www.siremlab.com/PFASsive/ (last visited Mar. 25, 2025).

60 *Id.*

61 *Id.*

62 Includes all downstream sample results where the downstream value exceeded the upstream value, with the exception of the Pearl Riverkeeper and Tampa Bay Waterkeeper sites that do not have upstream samples but whose downstream samples detected significant PFAS concentrations. Also includes a downstream sample from Inland Empire Waterkeeper from August 2024 where there was no upstream sample recovered. Only one type of PFAS, PFBS, was detected at an elevated level downstream from Parkersburg Utility Board.

63 Where a duplicate sample was obtained, the highest value for each analyte is reported.

64 Includes all downstream sample results where the downstream value exceeded the upstream value. No upstream sample was taken on Old Town Creek. Where a duplicate sample was obtained, the highest value for each analyte is reported.

65 See *Human Health Water Quality Criteria for PFAS*, EPA, *supra* note 32

66 See *Designation of PFOA and PFOS as Hazardous Substances, supra* note 30

67 See *Per- and Polyfluoroalkyl Substances (PFAS), supra note 29*

68 *Id.*

69 Anna Reade, *The Scientific Basis for Managing PFAS as a Chemical Class*, Nat. Res. Def. Council (June 30, 2020), www.nrdc.org/bio/anna-reade/scientific-basis-managing-pfas-chemical-class; *see generally* Kwiatkowski, *supra* note 1.

70 See, *e.g.*, *Human and Ecological Health Effects of Select PFAS,* Interstate Tech. Regul. Council, § 7.1.5.1, pfas-1.itrcweb.org/7-human-and-ecological-health-effects-of-select-pfas/ (last visited Mar. 25, 2025); Jesse A. Goodrich et al., *Metabolic Signatures of Youth Exposure to Mixtures of Per- and Polyfluoroalkyl Substances: A Multi-Cohort Study*, 131 Env't Health Perspectives 027005-1, 027005-8 (2023), ehp.niehs.nih.gov/doi/epdf/10.1289/EHP11372.

71 *Id.* at 027005-9.

72 *PFAS*, Env't Working Grp., Tapwater Database (Feb. 2025), www.ewg.org/tapwater/reviewed-pfcs.php.

73 EWG developed their health-based criteria for PFOA and PFOS based on EPA's review of toxicity studies and, for numerous other PFAS, based on health assessments published by the EPA and its recommendations for use for similar compounds. See *id.*

74 42 U.S.C. §§ 300f to 300j–9 (1974).

75 See *Per- and Polyfluoroalkyl Substances (PFAS), supra* note 29.

76 See *Human Health Water Quality Criteria*, *supra* note 32.

77 See *Per- and Polyfluoroalkyl Substances (PFAS), supra* note 29; Surface Water Quality, Interstate Tech. Regul. Council, https://pfas-1.itrcweb.org/16-surface-water-quality/ (current as of Nov./Dec. 2024).

78 In this column, the state, EPA, or EWG is identified as the source of the listed criteria.

79 As noted in this column, PFAS criteria for certain types of PFAS in Oregon, Rhode Island, and Wisconsin are based on the sum of concentrations for multiple PFAS. Additionally, as noted in this column, EPA has established a Hazard Index Value for mixtures containing two or more of PFHxS, PFNA, HFPO-DA, and PFBS.

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ENDNOTES

80 *PFDA (Perfluorodecanoic Acid)*, Env't Working Grp. Human Toxome Project, www.ewg.org/sites/humantoxome/chemicals/chemical.php?chemid=100301 (last visited Mar. 21, 2025).

81 *Perfluorodecanoic acid (PFDA)*, Env't Working Grp., Tapwater Database, www.ewg.org/tapwater/contaminant.php?contamcode=E285 (Mar. 25, 2025); *see also id.*

82 See Columbia Env't Rsch. Ctr., *Study Finds PFOSA Can Suppress Immune Function in Developing Zebrafish (Danio rerio)*, U.S. Geological Surv. (Aug. 28, 2024), www.usgs.gov/centers/columbia-environmental-research-center/science/study-finds-pfosa-can-suppress-immune.

83 *Perfluorooctanesulfonamide (PFOSA)*, Env't Working Grp., Tapwater Database, www.ewg.org/tapwater/contaminant.php?contamcode=E314 (last visited Mar. 21, 2025).

84 See EPA, ORD Human Health Toxicity Value for 6:2 Fluorotelomer Sulfonic Acid (CASRN 27619-97-2|DTXSID6067331) 3 (2024), cfpub.epa.gov/si/si_public_record_Report.cfm?dirEntryId=363720&Lab=CPHEA.

85 *6:2 Fluorotelomer Sulfonate (6:2 FTS)*, Env't Working Grp., Tapwater Database, www.ewg.org/tapwater/contaminant.php?contamcode=E318 (last visited Mar. 21, 2025).

86 It is notable that there are multiple permitted industrial dischargers to the Sumter Pocotaligo River WWTP that EPA has identified as possibly handling, using, or releasing PFAS chemicals in the metals-related industrial categories, including Armoloy Southeast (Metal Coating), Enersys—Sumter Metals (Metal Machinery Mfg.), Interlake Mecalux (Metal Machinery Mfg.), Metal Finishing Services, Inc. (Metal Coating), and Metokote Corporation (Metal Coating).

87 *Perfluorotetradecanoic Acid*, NIH Nat'l Libr. of Med., Nat'l Ctr. for Biotechnology Info., pubchem.ncbi.nlm.nih.gov/compound/Perfluorotetradecanoic-acid (last visited Mar. 21, 2025).

88 *Perfluorotetradecanoic Acid (PFTA)*, Env't Working Grp., Tapwater Database, www.ewg.org/tapwater/system-contaminant.php?pws=NC6054001&contamcode=E303 (last visited Mar. 21, 2025).

89 *Perfluoroheptane Sulfonic Acid (PFHpS)*, Env't Working Grp., Tapwater Database, www.ewg.org/tapwater/contaminant.php?contamcode=E312 (last visited Mar. 21, 2025).

90 *Perfluoro-4-methoxybutanic Acid (PFMOBA)*, Env't Working Grp., Tapwater Database, www.ewg.org/tapwater/contaminant.php?contamcode=E331 (last visited Mar. 25, 2025).

91 N.C. Dep't Env't Quality, Fiscal Note for Adoption Amendment of 15A NCAC 02B.0200 and 15A NCAC 02B.0400, at 57–58 (2024), www.deq.nc.gov/key-issues/july-2b-pfas-ria/open; Minn. Pollution Control Agency, Evaluation of Current Alternatives and Estimated Cost Curves for PFAS Removal and Destruction from Municipal Wastewater, Biosolids, Landfill Leachate, and Compost Contact Water 157–58 (2023), www.pca.state.mn.us/sites/default/files/c-pfc1-26.pdf.

92 EPA, Multi-Industry Per- and Polyfluoroalkyl Substances (PFAS) Study – 2021 Preliminary Report 1-1 (2021), *supra* note 27

93 *Id.*

94 See *EPA, Draft Sewage Sludge Risk Assessment*, Public Webinar, *supra* note 11, at 6.

95 *Detailed Facility Report: Sumter Pocataligo River WWTP*, EPA ECHO, echo.epa.gov/detailed-facility-report?fid=110017123496 (last visited Jan. 3, 2025).

96 *Id.* ECHO statistics last reviewed January 3, 2025.

97 See *PFAS Analytic Tools*, *supra* note 53.

98 *Ambient Surface Water PFAS Monitoring Application*, S.C. Dep't of Env't Servs., gis.dhec.sc.gov/gisportal/apps/webappviewer/index.html?id=162b8d1e7fdf459db7ff6b251671651f (last visited Oct. 30, 2024).

99 For purposes of this report, "regulated" in the section references federal regulations and does not address the range of state regulations of PFAS.

100 City of Graham, Fact Sheet NPDES Permit No. NC0021211 2 (2022), edocs.deq.nc.gov/WaterResources/DocView.aspx?id=2222173&dbid=0&repo=WaterResources&searchid=d0cb95d5-63ee-4dce-9a87-de8166e04e21.

101 *Detailed Facility Report: Graham WWTP City of*, EPA ECHO, echo.epa.gov/detailed-facility-report?fid=110000761890 (last visited Jan. 3, 2025).

102 *Id.* ECHO statistics last reviewed January 3, 2025.

103 See *generally* N.C. Dep't of Env't Quality, Final NPDES Permit Renewal, Graham WWTP (2022), edocs.deq.nc.gov/WaterResources/DocView.aspx?id=2229270&dbid=0&repo=WaterResources&searchid=9ad699aa-ee4a-4ae7-8bef-2aa5458fd591.

104 See *PFAS Analytic Tools*, *supra* note 53.

105 *Emerging Compound Facility Sampling*, N.C. Dep't of Env't Quality, ncdenr.maps.arcgis.com/apps/instant/attachmentviewer/index.html?appid=ed308373c97e4a23a29210fa53a3d404 (last visited Nov. 19, 2024).

106 See *generally* City of Graham, City of Graham Land Application 2023 Annual Report (2023) edocs.deq.nc.gov/WaterResources/DocView.aspx?id=3175263&dbid=0&repo=WaterResources&searchid=68b0599d-be54-455f-82c7-0190f3f48ec0.

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108 *Biosolids Facility Report: City Of Graham*, EPA ECHO, echo.epa.gov/biosolids-facility-report?id=NCL021211 (last visited Jan. 3, 2025).

109 See *Our Wastewater System*, Great Lakes Water Auth., www.glwater.org/our-system/wastewater-system (last visited Nov. 15, 2024).

110 GLWA WRRFdischarges from three outfalls, only one of which discharges to Rouge River (Outfall 050). According to the facility's NPDES permit, GLWA WRRF may not discharge from Outfall 050 "unless hydraulically or structurally necessary." Mich. Dep't of Env't, Great Lakes, and Energy, NPDES Permit No. MI0022802, at 10 (2019), jeffersonchalmerswaterproject.org/323_m_NPDES%20Permit%20-%20FINAL-GLWA%20WRRF.pdf.

111 Great Lakes Water Auth., Wastewater Master Plan 7-1 (2020), glwa.wpenginepowered.com/wp-content/uploads/2020/12/Full_WWMP_Report_Final_June-2020.pdf.

112 *Detailed Facility Report: GLWA Water Resource Recovery Facility*, EPA ECHO, echo.epa.gov/detailed-facility-report?fid=110000555435&ej_type=sup&ej_compare=US (last visited Jan. 3, 2025).

113 *Id.* ECHO statistics last reviewed January 3, 2025.

114 Mich. Dep't of Env't, Great Lakes, and Energy, NPDES PERMIT NO. MI0022802, at 44 (2019), jeffersonchalmerswaterproject.org/323_m_NPDES%20Permit%20-%20FINAL-GLWA%20WRRF.pdf. As of 2024, the State of Michigan has set a WQS for PFOS at 11 ppt and a WQBEL for PFOA at 8,040 ppt. See Great Lakes Water Auth., Status Report—Pollutant Minimization and Source Evaluation Program for PFOS and PFOA 2 (2024), glwa.wpenginepowered.com/wp-content/uploads/2024/09/PFOA_PFOS-Minimization-Program-May-2024.pdf.

115 Great Lakes Water Auth., IPP Rules_2024, *supra* note 54 at 16

116 See *generally* Great Lakes Water Auth., Status Report—Pollutant Minimization and Source Evaluation Program for PFOS and PFOA, *supra* note 114

117 *Id.* at attach. 1. GLWA WRRF defines a "Significant Source" as one where "PFAS-based compounds were identified or used in their processes, or PFOS and/or PFOA concentrations exceed EGLE's Water Quality Standards (WQS) of 11 [ppt] (PFOS) or 420 [ppt] (PFOA) from one or more sampling events." *Id.* at 5. The facility classifies a facility as a "Potential Source" "where at least one sample result exceeds EGLE's Water Quality Standards." *Id.* at 6.

118 See *PFAS Analytic Tools*, *supra* note 53.

119 Evaluation of PFAS in Influent, Effluent, and Residuals of Wastewater Treatment Plants (WWTPs) in Michigan, EGLE, Project Number: 60588767 (Apr. 2021), https://www.michigan.gov/egle/-/media/Project/Websites/egle/Documents/Programs/WRD/IPP/pfas-initiatives-statewide-full-report.pdf?rev=90923004ae6448c9a17f0e1f4b3d90de&hash=AB84F5CFA197AC923AC4F51717F75085.

120 See *Status Report—Pollutant Minimization and Source Evaluation Program*, *supra* note 114, at 7.

121 See *id.* at attach. 2.

122 A cement plant with an average facility flow of 0.0031 MGD in 2024 (St. Marys Cement - Permit No. MI0004243) and a Combined Sewer Overflow outlet with no reported overflow events in 2024 (Wayne Country Rouge River CSO RTB - Permit No. MI0028819) also discharge to this part of the Rouge River. See Pollutant Loading Report (DMR), St. Marys Cement, EPA ECHO, https://echo.epa.gov/trends/loading-tool/reports/dmr-pollutant-loading?permit_id=MI0004243&year=2024 (last visited June 14, 2025); MiEnviro Portal CSO/SSO List, Mich. Env., Great Lakes, and Energy, https://mienviro.michigan.gov/ncore/external/overflow/list (last visited June 14, 2025).

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124 Permit Application for 23DP0801, NPDES Permit No. MD0021610, MD Dept. of Env., https://mes-mde.mde.state.md.us/WastewaterPermitPortal/ (last visited June 17, 2025).

125 *Id.*

126 *Id.*

127 *Detailed Facility Report: Frederick WWTP*, EPA ECHO, https://echo.epa.gov/detailed-facility-report?fid=110000557166 (last visited June 14, 2025). ECHO statistics last reviewed June 14, 2025.

128 Industrial Pretreatment Ordinance (Amended by Ordinance G-15-08), City of Frederick, MD, https://www.cityoffrederickmd.gov/DocumentCenter/View/4901/G-15-08-Concerning-Industrial-Pretreatment?bidId= (last visited June 14, 2025).

129 See *PFAS Analytic Tools*, *supra* note 53.

130 Map of Land Application Permits for Biosolids in Maryland, Potomac Riverkeeper Network, https://www.potomacriverkeepernetwork.org/md-biosolids-permit-app-map/ (last visited June 17, 2025); Nutrient Management Plan Update, CA 37: Baungartner & Zack Property, Synagro Permit No. 2017-SAG-5979 (Sept. 17, 2021), https://mdedataviewer.mde.state.md.us/OpenDataDocuments?ID=2216012.

131 For purposes of analysis, "regulated" in the section references federal regulations and does not address the range of state regulations of PFAS.

132 Or. Dep't of Env't Quality, NPDES Permit Renewal Fact Sheet Clean Water Services 10 (2022), ormswd2.synergydcs.com/HPRMWebDrawer/RecordView/6369437.

133 *Id.*

134 *Detailed Facility Report: Rock Creek WRRF*, EPA ECHO, echo.epa.gov/detailed-facility-report?fid=110037740068&ej_type=sup&ej_compare=US (last visited Jan. 16, 2025).

135 *Id.* ECHO statistics last reviewed January 16, 2025.

136 Clean Water Servs., 2022 Annual Report 2, 3 (2022), cleanwaterservices.org/wp-content/uploads/2023/05/2022-NPDES-Annual-Report-Pretreatment-Program.pdf.

137 See *generally* Or. Dep't of Env't Quality, Clean Water Services NPDES Permit (2022), www.oregon.gov/deq/FilterPermitsDocs/MS4CWSPermit.pdf.

138 See *PFAS Analytic Tools*, *supra* note 53.

139 Clean Water Servs., *Introduction to PFAS Efforts at CWS*, *in* Information for March 13, 2024, CWAC Meeting 8 (2024), cleanwaterservices.org/wp-content/uploads/2024/03/CWAC-Agenda-Packet-03_13_2024.pdf.

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141 See *NPDES Permit Renewal Fact Sheet Clean Water Services*, *supra* note 132, at 10.

142 See *Introduction to PFAS Efforts at CWS*, *supra* note 139, at 6.

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144 *Sewer*, City of Riverside, https://riversideca.gov/publicworks/sewer (last visited Nov. 26, 2024).

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146 *Id.* ECHO statistics last reviewed January 3, 2025.

147 See *generally* Cal. Reg'l Water Quality Control Bd., Renewal of Waste Discharge and Producer/User Reclamation Requirements for the Riverside RWQCP (2013), https://www.waterboards.ca.gov/santaana/board_decisions/adopted_orders/orders/2013_orders.html

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153 *Perfluorooctanoic Acid (PFOA) and Perfluorooctane Sulfonic Acid (PFOS) in Drinking Water*, Cal. Off. of Env't Health Hazard Assessment, oehha.ca.gov/water (last visited April 7, 2025).

154 *Notification Level Issuance,* Cal. Water Bds., www.waterboards.ca.gov/drinking_water/programs/documents/PFHxS-issuance.pdf (last visited April 7, 2025).

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157 City of Waukesha, Description of Process 2 (2023), webfile.waukesha-wi.gov/waukesha/Document_Center/Government/Clean%20Water/Description%20of%20Water%20Treatment%20Process%20(PDF).pdf.

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160 *See generally WPDES Permit*, *supra* note 155 and 156.

161 See *PFAS Analytic Tools*, *supra* note 53.

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163 Waukesha City, WPDES Wastewater Discharge Individual Permit Application 34 (2017), https://dnr.wisconsin.gov/sites/default/files/topic/WaterUse/Waukesha/WaukeshaWPDESpermitApplication.pdf

164 City of Spokane Pub. Works, Application for Renewal of NPDES Municipal Wastewater Discharge Permit 2 (2021), apps.ecology.wa.gov/paris/DownloadDocument.aspx?Id=357285. *Note: This is a Direct Download Link*

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191 See *PFAS Analytic Tools*, *supra* note 53.

192 For purposes of analysis, "regulated" in the section references federal regulations and does not address the range of state regulations of PFAS.

193 See Jefferson Cnty. Comm'n, 2021 Beneficial Use of By-Product Material, Annual Reporting and Applications 2 (2022), lf.adem.alabama.gov/WebLink/DocView.aspx?id=104822881&dbid=0.

194 See *Ala. Dep't of Env't Mgmt., Final Permit Modification*, *supra* note 185; Draft Permit, Valley Creek WRF (2023), *supra* note 190.

195 Upon retrieval, the primary downstream sampling device was found to be buried below roughly 4 inches of sediment. The duplicate sample was not buried in sediment at the time of retrieval. This likely accounts for the differences in analytical results between the primary and duplicate downstream samples.

196 Demographic information in this section is sourced from data obtained through EPA EJScreen, see EJScreen *supra* note 40.

197 Detailed Facility Report: Homestead WWTP, EPA ECHO, https://echo.epa.gov/detailed-facility-report?fid=110033926278 (last visited June 17, 2025).

198 See *PFAS Analytic Tools*, *supra* note 53.

199 For purposes of analysis, "regulated" in the section references federal regulations and does not address the range of state regulations of PFAS.

200 Detailed Facility Report: R.M. Clayton WRC, EPA, ECHO, https://echo.epa.gov/detailed-facility-report?fid=110011331022&ej_type=sup&ej_compare=US (last visited June 17, 2025).; Detailed Facility Report: City of Atlanta CSO West Area, https://echo.epa.gov/detailed-facility-report?fid=110020834533 (last visited June 17, 2025); Detailed Facility Report: R.L. Sutton WRF, https://echo.epa.gov/detailed-facility-report?fid=110009358015 (last visited June 17, 2025). The sampling sites were also upstream and downstream from two industrial stormwater outfalls associated with an asphalt plant.

201 See *PFAS Analytic Tools*, *supra* note 53.

202 Detailed Facility Report: Rainbow City WWTP, https://echo.epa.gov/detailed-facility-report?fid=110055974147 (last visited June 17, 2025).

203 Nutrient Managment Plan for the Land Application of Municipal Biosolids From: Utilities Board of Rainbow City, AL, Denali Water Solutions, (Aug. 2023), https://lf.adem.alabama.gov/WebLink/DocView.aspx?id=105181103&dbid=0&cr=1

204 A stormwater outfall (Outfall 003) for Gadsden West River WWTP, NPDES Permit No. AL0053201, is also located in the section of Big Wills Creek between the upstream and downstream sampling sites.

205 Detailed Facility Report: Suffern (V) STP, EPA ECHO, https://echo.epa.gov/detailed-facility-report?fid=110006621496 (last visited June 17, 2025); Detailed Facility Report: Western Ramapo Advanced WWTP, EPA ECHO, https://echo.epa.gov/detailed-facility-report?fid=110020151253 (last visited June 17, 2025).

206 Disadvantaged Communites Criteria, N.Y. Dep't of Env't Conservation, https://climate.ny.gov/Resources/Disadvantaged-Communities-Criteria (last visited June 10, 2025).

207 *See PFAS Analytic Tools, supra* note 53.

208 Ramapo Valley Well Field, Permit No. NY0248258, also discharges untreated groundwater to augment river flow seasonally as needed. Env. Notice Bulletin, Ramapo Valley Well Field Discharge, N.Y. Dep't of Env't Conservation, https://dec.ny.gov/news/environmental-notice-bulletin/2023-03-01/completed-application/ramapo-valley-well-field-discharge (last visited June 14, 2025).

209 *Emerging Contaminants in N.Y.'s Waters*, N.Y. Dep't of Env't Conservation, dec.ny.gov/environmental-protection/water/emerging-contaminants (last visited April 7, 2025).

210 South Central Financial Statements, Year Ended June 30, 2024, scwwa.org/wp-content/uploads/2024/11/South-Central-Wastewater-Authority-2024.pdf; Detailed Facility Report: South Central Wastewater Authority WWTF, https://echo.epa.gov/detailed-facility-report?fid=110008192918 (last visited June 17, 2025).

211 See *PFAS Analytic Tools*, *supra* note 53.

212 See *generally* South Central Wastewater Authority, Request For Proposal, RFP #24-0812 – Biosolids Disposal (2024), govtribe.com/file/government-file/24-0812-scwwa-biosolids-rfp-dot-pdf.

213 *Biosolids Facility Report: Petersburg STP*, EPA ECHO, echo.epa.gov/biosolids-facility-report?id=VAL025437 (last visited Dec. 9, 2024).

214 See, e.g, Petersburg Virgina, Sludge Management, http://www.petersburg-va.org/562/Public-Private-Education-Facilities (last visited June 11, 2025); Letter from Carolanne M. Whiteside, Synagro Technical Service Coordinator to Virginia Dept. of Env. Quality, (Mar. 14, 2023), https://www.goochlandva.us/DocumentCenter/View/9390/Synagro---March-14-2023 (last visited June 11, 2025).

215 See Permit No. VPA00836, VA Dept. of Env. Quality, https://www.deq.virginia.gov/permits/public-notices/water/land-application-virginia-pollution-abatement-vpa (last visited June 11, 2025).

216 Detailed Facility Report: Waterbury WPCF, EPA ECHO, https://echo.epa.gov/detailed-facility-report?fid=110035779789 (last accessed June 17, 2025).

217 See *PFAS Analytic Tools*, *supra* note 53.

218 LA Sanitation City of Los Angeles, Los Angeles-Glendale Water Reclamation Plant, https://sanitation.lacity.gov/san/faces/home/portal/s-lsh-wwd/s-lsh-wwd-cw/s-lsh-wwd-cw-p?_adf.ctrl-state=vdlc0vvep_10&_afrLoop=1540858680529765#! (last visited June 11, 2025); Detailed Facility Report: LA-Glendale WRP, https://echo.epa.gov/detailed-facility-report?fid=110035779789 (last accessed June 17, 2025).

219 See, LA River Master Plan, Existing Conditions Summary, https://larivermasterplan.org/about/existing-conditions-summary/ and Background, https://larivermasterplan.org/about/background/ (last visited June 11, 2025).

220 See *PFAS Analytic Tools*, *supra* note 53.

221 See *Perfluorooctanoic Acid (PFOA) and Perfluorooctane Sulfonic Acid (PFOS) in Drinking Water*, *supra* note 153.

222 Detailed Facility Report: Cranston WPCF, EPA ECHO, https://echo.epa.gov/detailed-facility-report?fid=110000735713&ej_type=sup&ej_compare=US (last visited June 17, 2025).

223 See *PFAS Analytic Tools*, *supra* note 53.

224 Detailed Facility Report: Jackson POTW, Savanna Street, EPA ECHO, https://echo.epa.gov/detailed-facility-report?fid=110000727394&ej_type=sup&ej_compare=US (last visited June 17, 2025); Detailed Facility Report: West Rankin Utility Authority WWTF, EPA ECHO, https://echo.epa.gov/detailed-facility-report?fid=110064616535 (last visited June 17, 2025); Detailed Facility Report: Jackson POTW, Trahon and Big Creek WWTF, EPA ECHO, https://echo.epa.gov/detailed-facility-report?fid=110055990726 (last visited June 17, 2025).

225 See *PFAS Analytic Tools*, *supra* note 53.

226 Detailed Facility Report: Plant City WRF, EPA ECHO, https://echo.epa.gov/detailed-facility-report?fid=110035612539 (last visited June 17, 2025).

227 See *PFAS Analytic Tools*, *supra* note 53.

228 Berkeley Country PSSD - OH/ INW/ BH/ NE 001-004 (Inwood), EPA ECHO, https://echo.epa.gov/detailed-facility-report?fid=110015983328 (last visited June 17, 2025).

229 See *PFAS Analytic Tools*, *supra* note 53.

230 Permit No.WV 0082759, West VA Dept. of Env. Protection, at 76, https://documents.dep.wv.gov/AppXtender/datasources/DEPAX16/applications/38/document/863955?lqid=-1&lqrid=%7B4a55c8f5-63c0-4f64-a610-2d03bfefdc40%7D&lqaid=38&qrid=%7B4a55c8f5-63c0-4f64-a610-2d03bfefdc40%7D&qridx=0 (last visited June 17, 2025).

231 Detailed Facility Report: Parkersburg Utility Board, https://echo.epa.gov/detailed-facility-report?fid=110010868016&ej_type=sup&ej_compare=US (last visited June 17, 2025).

232 See *PFAS Analytic Tools*, *supra* note 53.

233 All bill numbers refer to introductions in the 118th Congress.

234 *Pappas, Gillibrand, Fitzpatrick, Kildee Introduce Bipartisan Legislation to Address PFAS Contamination and Hold Polluters Accountable*, Congressman Chris Pappas (Apr. 18, 2024), pappas.house.gov/media/press-releases/pappas-gillibrand-fitzpatrick-kildee-introduce-bipartisan-legislation-to-address-pfas-contamination-and-hold-polluters-accountable.

235 See *State Legislation and Federal Action*, *supra* note 28.

236 *Our Priorities: PFAS "Forever Chemicals"*, Safer States, www.saferstates.org/priorities/pfas/ (last visited Mar. 7, 2025).

237 See PFAS Land Application Regulations, Most Policy Initiative, https://mostpolicyinitiative.org/science-note/pfas-land-application-regulations/#:~:text=PFAS%20builds%20up%20in%20biosolids%20used%20in%20land%20application.&text=A%20biosolid%20is%20a%20treated,or%20fertilizer%20(EPA%202025). (last visited June 15, 2025).

238 See *Perfluorooctanoic Acid (PFOA) and Perfluorooctane Sulfonic Acid (PFOS) in Drinking Water*, *supra* note 153.

239 *Gov. Murphy Signs Nation-Leading PFAs Bill Into Law, More Needed for Strongest Protections*, Sierra Club, NJ Chapter (Jan. 22, 2024), www.sierraclub.org/new-jersey/blog/2024/01/gov-murphy-signs-nation-leading-pfas-bill-law-more-needed-strongest.

From:	Joel Geier
To:	Benton Public Comment
Subject:	Re: LU-24-027 Coffin Butte Landfill expansion: Response to new evidence (PFAS to WWTP) - correction
Date:	Wednesday, July 16, 2025 3:56:00 PM

Dear Chair Fowler, Vice Chair Hamann, and Planning Commissioners Biscoe, Cash, Fulford, Lee, Struthers, and Wilson:

CORRECTION:
This message should have referred to the Annex as "Waterkeeper report" rather than "Riverkeeper report." This mistake is also repeated in the first attachment where I referred to the same report by the same incorrect name. My apologies for the error; I hope this correction clears up any confusion.

The attached document is my 7th of 8 planned submissions which I'm sending in response to new evidence presented at the July 8-9th hearing.

This covers the following topic:

7) PFAS a.k.a. "forever chemicals" in leachate shipments to wastewater treatment plants (WWTPs)

There appears to be a math error close to a factor of 100, in the information that was provided to you by the applicant. As an annex, I've included the full **Waterkeeper** report which I also mentioned in my testimony on July 9th.

I do hope that the following will make the numbers and proportions easier to comprehend in real-life terms:

Imagine that, every other day, you go out to your front porch to find that the applicant has delivered 3 gallon jugs (like milk jugs) to your front porch, filled with a murky-looking liquid, with a note asking you to kindly pour the contents down your kitchen sink or your toilet, whichever you prefer.

That, in effect, is what the applicant has been asking the City of Corvallis to do for years. The applicant has hinted that they might find some other town willing to do that for them, but they haven't said who.

Thank you once again for your careful consideration of the issues. Again, I urge you to deny this application.

Yours sincerely,
Joel Geier
38566 Hwy 99W
Corvallis OR 97330-9320

From:	Joel Geier
To:	Benton Public Comment
Subject:	LU-24-027 Coffin Butte Landfill expansion: Response to new evidence (groundwater impacts)
Date:	Wednesday, July 16, 2025 4:51:22 PM
Attachments:	Geier_8_GroundwaterImpacts.pdf

Dear Chair Fowler, Vice Chair Hamann, and Planning Commissioners Biscoe, Cash, Fulford, Lee, Struthers, and Wilson:

The attached document is my 8th of 8 planned submissions which I'm sending in response to new evidence presented at the July 8-9th hearing.

This covers the following topic:

8) Groundwater impacts

As you might guess, I have more to say on this topic. But I see I've run out of time, which might be merciful for you.

Thank you once again for your careful consideration of the issues, your dedication is much appreciated by the community.

Yours sincerely,
Joel Geier, Ph.D.
38566 Hwy 99W
Corvallis OR 97330-9320

Issue:

Applicant's assertion that "Past development of the Coffin Butte Landfill has not measurably affected groundwater in the surrounding community" is not supported by adequate data to justify the word "surrounding."

New evidence:

Republic's slide deck for July 8th, slide 14 states: "Past development of the Coffin Butte Landfill has not measurably affected groundwater in the surrounding community."

Response:

This lacks evidence regarding **groundwater availability** and is plainly false regarding **groundwater quality**.

In terms of groundwater availability, the applicant has not presented any data for water levels in most residential wells on neighboring properties, with the exception of the Helms well (before it was decommissioned) and the Philipps well, plus wells on two other properties that they acquired low down on the slope of Beals Hill (a spur of Tampico Ridge), namely the former Berkland and Merril properties. Outside of that limited area on one limited side of the active landfill site, they lack data to support this statement.

If the applicant had gone around the wider neighborhood, measured water levels and performed pumping tests in private wells earlier in the development of the landfill, that could have given them a baseline for making this assertion. Or if they had set up a wider monitoring network on their own initiative, instead of just installing enough wells to meet DEQ's requirements. But they haven't done so.

Regarding **groundwater quality**, the Benton County Talks Trash report, which has been previously entered into the record, states on p. 32:

> *During the 1980s, the landfill operator purchased several properties surrounding the landfill, some belonging to **residents whose water supplies were compromised as a result of landfill operations. A household well west of the landfill, on the former Helms home site, received sufficient contamination from the landfill site and was decommissioned under DEQ supervision.***
>
> *A DEQ report on the situation notes that practices at the landfill were being adjusted to minimize future problems, and the responses included the decommissioning of some wells. "Decommissioning water wells within the LOF ("Location of Facility") or in areas potentially downgradient of impacts removes potential exposure to contaminants in groundwater. Two wells currently proposed for decommissioning include PW-1, which is within the LOF, but currently unused, and the Helms well, which is outside and downgradient of the LOF. The Helms well will be used (with carbon filter unit) until September 2006 at which time it will be disconnected from use and scheduled for decommissioning."*

Record of Decision for Coffin Butte, October 2005. Oregon Department of Environmental Quality, October, 2005, states specifically, under Section 5.2 Elements of Landfill Remedy:

5.2.5 Water Well Removal
Decommissioning water wells within the LOF or in areas potentially downgradient of impacts removes potential exposure to contaminants in groundwater. Two wells currently proposed for decommissioning include PW-1, which is within the LOF, but currently unused, and the Helms well, which is outside and downgradient of the LOF. The Helms well will be used (with carbon filter unit) until September 2006 at which time it will be disconnected from use and scheduled for decommissioning.

5.2.6 Property Purchase
Property purchase near the landfill is an effective means of preventing groundwater use and minimizing land uses not compatible with landfill operations. Such purchases can have a secondary benefit of providing additional buffer area around the landfill and long-term access to groundwater monitoring wells. As property adjacent to the landfill property comes on the market, VLI will pursue negotiations with the owners to buy the property. Properties of current interest to the VLI include the Phillips property south of the landfill and the small rectangular piece of property immediately west of the Closed Landfill, east of Wiles Road.

See also: Wilson, Bob and Gordon Brown, “1993 Coffin Butte Annual Report”, July 19, 1994
https://www.co.benton.or.us/sites/default/files/fileattachments/community_development/page/8139/1993_coffin_butte_landfill_annual_report.pdf
which explains the situation thus:

> **Helms' Well**
>
> In October 1993, volatile organic compounds (VOC's) were detected in a domestic well located near the landfill. A subsequent sample taken in early 1994 confirmed those findings. The well serves the Helms' residence and is downgradient from an area of the landfill which was closed in 1977, prior to most of the environmental controls we have today. So far, Valley Landfills has installed a water treatment system for the Helms. The untreated water could pose a health threat to persons consuming or bathing with it. Also, using the untreated water to irrigate food crops must be avoided as the aerosol from spraying the water and plant uptake of the compounds could pose further threats to human health. No further action is planned at this time except to continue monitoring this and other wells in the area.

In addition to the contamination discovered in the Helms well, Annual Environmental Monitoring Reports (AEMRs) submitted for this site have **repeatedly** acknowledged releases of leachate by seepage from the area of Cell 2, which was identified from high arsenic levels in groundwater, first detected in MW-23 when this was first sampled in 1994-1995, but occurring for an unknown period prior.

In written materials submitted previously by VLI, their consultants have tried to explain away the high arsenic levels seen near that part of the landfill, by claiming that the arsenic is "naturally occurring."

They based this on the speculative idea that arsenic leaches out of "volcanic rocks" when these are contacted by groundwater with low oxygen content. This speculative explanation has a major flaw, as I've pointed out in recent written and verbal testimony:

> **Their proposed mechanism is only scientifically supported for volcanic rocks of rhylotic to intermediate composition, but ....**

The volcanic rocks at Coffin Butte are basaltic (which is at the opposite end of the composition scale from "rhyolitic");

In other words, "Nice idea, but it doesn't work." And VLI has acknowledged seepage from Cell 2 as a source of arsenic contamination in the past.